Fishery Management Report No. 00-1

Area Management Report for the Recreational Fisheries of the Kodiak and Alaska Peninsula/Aleutian Islands Regulatory Areas, 1997 and 1998.

by

Len Schwarz

and

Mark Clapsadl

February 2000

Alaska Department of Fish and Game **Division of Sport Fish**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used in Division of Sport Fish Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications without definition. All others must be defined in the text at first mention, as well as in the titles or footnotes of tables and in figures or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
ounce	oz
pound	lb
quart	qt
yard	yd

Spell out acre and ton.

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s

Spell out year, month, and week.

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
and	&
at	@
Compass directions:	
east	E
north	N
south	S
west	W
Copyright	©
Corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
id est (that is)	i.e.,
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	F, t, χ^2, etc.
confidence interval	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	Var

FISHERY MANAGEMENT SERIES NO. 00-1

AREA MANAGEMENT REPORT FOR THE RECREATIONAL FISHERIES OF THE KODIAK AND ALASKA PENINSULA/ALEUTIAN ISLANDS REGULATORY AREAS, 1997 AND 1998

by

Len Schwarz and Mark Clapsadl
Division of Sport Fish, Kodiak

Alaska Department of Fish and Game
Division of Sport Fish, Policy and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1599

February 2000

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The Fishery Management Reports series was established in 1989 for the publication of an overview of Division of Sport Fish management activities and goals in a specific geographic area. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Distribution is to state and local publication distribution centers, libraries and individuals and, on request, to other libraries, agencies, and individuals. This publication has undergone regional peer review.

Len Schwarz and Mark Clapsadl
Alaska Department of Fish and Game, Division of Sport Fish
211 Mission Road, Kodiak, AK 99615-6399, USA

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PREFACE

This report is divided into two sections. Section I presents an introductory overview of the Kodiak Management Area. Included in this section are a general geographic and organizational description of the management area; an overview of the Alaska Board of Fisheries processes and schedules for the management area; an inventory of the available fishery resources of the management area; a historical perspective of recreational angler effort and harvest within management area waters; an approximation of the economic value of the recreational fisheries of the management area; a general description of stocking, research, management, and access activities being conducted in the management area; and a summary of the major fishery and social issues that presently occur in the Kodiak Management Area. Recommendations for solving these social issues including, but not limited to, research, management, access, regulatory changes, stocking, or habitat options are also presented.

Section II provides a more detailed summary of the major chinook and coho salmon fisheries that occur in the Kodiak Management Area. Included in this section are a description and historical perspective of each fishery, the objective governing the management of each fishery, description of the recent performance of each fishery, a description of recent Board of Fisheries actions with respect to each fishery, a description of any social or biological issues surrounding each fishery, and a description of any ongoing or recommended research or management activities directed at each fishery.

None of the sport fisheries in the Kodiak Management Area have fisheries management plans associated with them and usually are not restricted by emergency order inseason. Inseason management approaches are discussed for applicable fisheries. If information is available, the fishery outlook for the immediate future is presented.

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SECTION I: MANAGEMENT AREA OVERVIEW

Section I presents an introductory overview of the Kodiak Management Area. Included in this section are a general geographic and organizational description of the management area; an overview of the Alaska Board of Fisheries processes and schedules for the management area; an inventory of the available fishery resources of the management area; a historical perspective of recreational angler effort and harvest within management area waters; an approximation of the economic value of the recreational fisheries of the management area; and a general description of stocking, research, management, partnership, aquatic education, viewing, and access activities being conducted in the management area.

MANAGEMENT AREA DESCRIPTION

The Kodiak sport fish management area (KMA) includes all waters of the Kodiak Island Archipelago, the Alaska Peninsula south of a line from Cape Douglas to Cape Menshikoff, and the Aleutian Islands (Figure 1). This management area is composed of two sport fishing regulatory areas: the Kodiak Regulatory Area and the Alaska Peninsula/Aleutian Islands Regulatory Area. With the exception of the road-accessible streams located in Kodiak, Adak, Cold Bay, and Dutch Harbor, virtually all sport fisheries in the KMA are remote and relatively difficult to access. A coastal climate with high precipitation and mild temperatures characterizes much of the KMA.

Principal land managers in the KMA include the U.S. Fish and Wildlife Service, National Park Service, U.S. Forest Service, various Native corporations, and the State of Alaska. The communities of Kodiak and Dutch Harbor/Unalaska, with populations of 13,900 and 4,100, respectively, are the two largest communities. The area also includes approximately 20 villages with year-round inhabitants. A major U.S. Navy Base on Adak Island has been closed and the past Adak population of 5,000 people has dropped to about 100 people.

Management and research functions for the KMA are based in the Kodiak area office. The Division of Sport Fish staff stationed in Kodiak includes two permanent full time Fisheries Biologists: Len Schwarz, Area Fisheries Biologist III and Mark Clapsadl, Assistant Area Biologist II. One permanent full time clerical position (Doris Mensch) is stationed in Kodiak and shared with the Division of Wildlife Conservation staff. Support is also provided to the area staff from the Sport Fish Division southcentral regional Research and Technical Services (RTS) staff. Seasonal staff includes four fish and wildlife technicians and one college intern. Seasonal staff assist in operating department programs which include operating weirs, biological sampling, creel surveys, stocking, and escapement surveys.

ALASKA BOARD OF FISHERIES ACTIVITIES

The process of developing fishing regulations appropriate for fisheries in the KMA occurs within the established Alaska Board of Fisheries process. Public input concerning regulation changes and allocation issues is provided for in this process through various means including direct testimony to the Board of Fisheries, and through participation in local fish and game advisory committees. These advisory committees have been established throughout Alaska to assist the Boards of Fisheries and Game in assessing fisheries and wildlife issues and proposed regulation changes in areas that might be affected. Most active committees meet at least once each year, usually in the fall prior to the Board meetings. Staff from the Division of Sport Fish and other

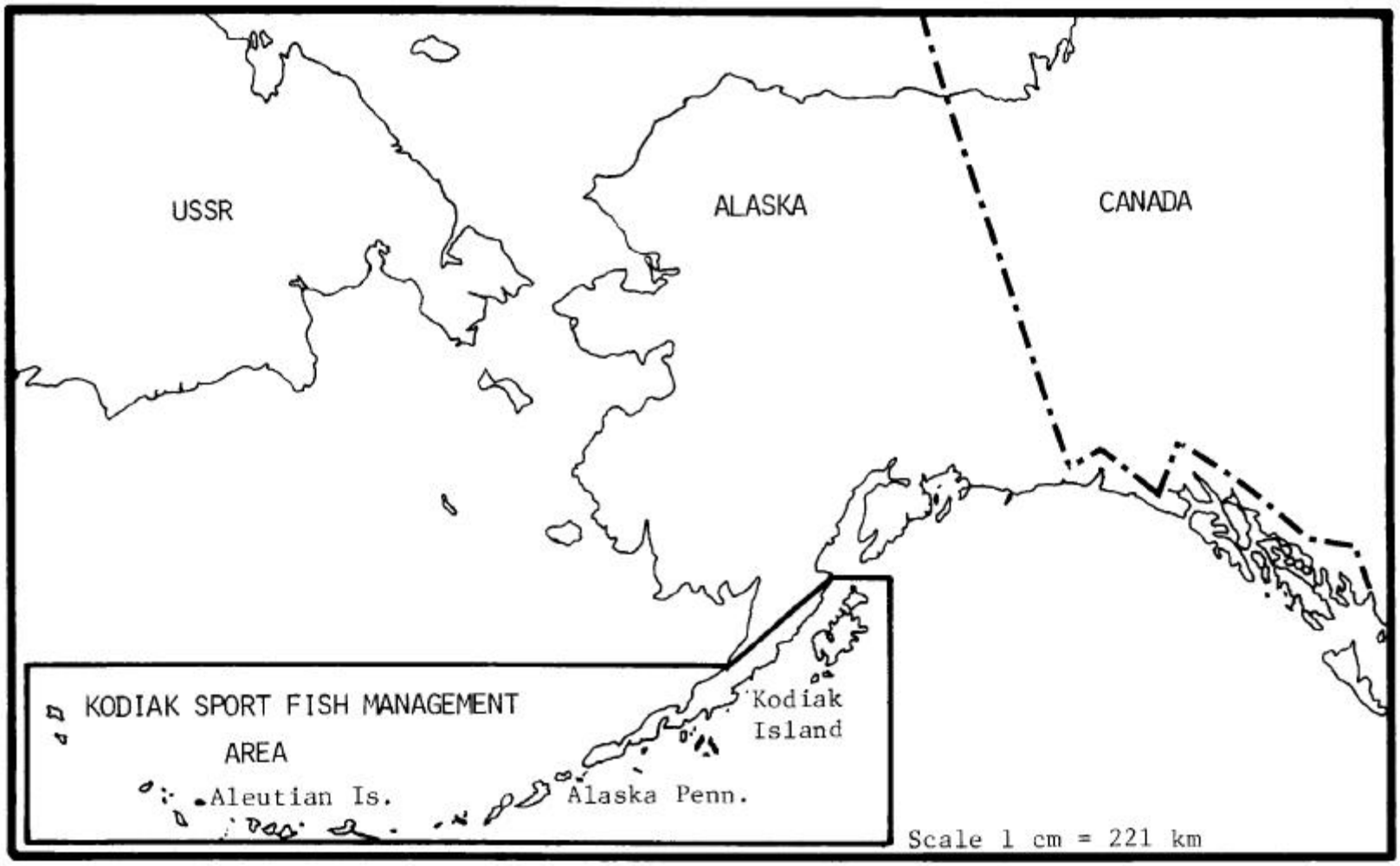

Figure 1.-The Kodiak Management Area: Kodiak Island Archipelago, Alaska Peninsula, and Aleutian Islands.

divisions are often invited to attend the committee meetings. In this way, advisory committee meetings allow for direct public interaction with staff involved with resource issues of local concern. Within the KMA there are seven Fish and Game Advisory Committees: Chignik, False Pass, King Cove, Kodiak, Nelson Lagoon, Sand Point, and Dutch Harbor/Unalaska.

Under the current operating schedule, the Board of Fisheries meets on a 3-year cycle. Alaska Peninsula/Aleutian Island proposals were heard during the January 1998 meeting. Proposals regarding the Kodiak Regulatory Area will be heard during the January 1999 meeting.

FISHERIES RESOURCE INVENTORY

Sport anglers fishing KMA waters can target all five species of North Pacific salmon (pink *Oncorhynchus gorbuscha*, coho *O. kisutch*, sockeye *O. nerka*, chum *O. keta*, and chinook *O. tshawytscha*) in both fresh and salt water. In addition, there are saltwater sport fisheries for halibut *Hippoglossus stenolepis*, rockfish *Sebastes* and lingcod *Ophiodon elongatus*. There are also fisheries for Dolly Varden *Salvelinus malma*/Arctic char *Salvelinus alpinus* and steelhead/ rainbow trout *O. mykiss* as well as fisheries for stocked landlocked coho salmon.

The Division of Sport Fish classifies sport fisheries into one of three levels based on a combination of yield (harvest) and angler-cost criteria. Level 1 fisheries are defined as high yield, low angler-cost fisheries. These fisheries are typically entry level fisheries where anglers can participate at little direct cost. Level III fisheries are defined as low yield, high cost fisheries. These fisheries are typically remote, guided, or special management fisheries that have a high cost associated with participation. Level II fisheries fall between Level I and Level III fisheries and are defined as basic yield, intermediate-cost fisheries.

The KMA offers diverse fishing opportunities for the recreational angler. Stocked lakes and road-accessible salmon and Dolly Varden fisheries near the cities of Kodiak and Dutch Harbor provide Level I fisheries. Marine waters near Kodiak and Unalaska islands offer Level II fisheries for halibut and rockfish. Another example of a Level II fishery in the KMA is boat-accessible salmon fisheries on Afognak Island. Remote steelhead trout and chinook salmon stocks, such as those in the Karluk and Ayakulik rivers which are accessible by aircraft, offer Level III fisheries.

RECREATIONAL ANGLER EFFORT

From 1977 through 1997 an average of 101,320 angler-days were expended by recreational anglers fishing KMA waters (Table 1) [1]. Recreational angler effort increased annually from 1977 through 1982, after which effort generally stabilized between 90,000 and 110,000 angler-days up to 1989 (Figure 2). The estimated sport effort for the KMA peaked during 1991 with 139,480 angler-days (Mills 1992). The 1997 effort of 113,380 angler-days (Howe et al. 1998) was average when compared to the recent 10-year average of 111,560 angler-days (Mills 1988-1994, Howe et al. 1995-1997).

[1] Effort and harvest figures cited in this report are from Mills (1979-1994) and Howe et al. (1995-1998, *In prep*), unless otherwise noted. Numbers presented in the text throughout this report have been rounded off to the nearest 10. Numbers in the tables represent the actual estimate or count.

Table 1.-Number of angler-days of effort expended by sport anglers fishing Kodiak Management Area waters, 1977-1997.

	Alaska Peninsula/Aleutian Island Regulatory Area						Kodiak Island Regulatory Area						
	Salt Water		Fresh Water		Area Total		Salt Water		Fresh Water		Area Total		KMA
Year	Ang-Days	Percent	Ang-Days	Percent	Total	% of KMA	Ang-Days	Percent	Ang-Days	Percent	Total	% of KMA	Total
1977					11,581	22	14,957	36	26,606	64	41,563	78	53,144
1978					8,766	16	19,063	43	25,439	57	44,502	84	53,268
1979					12,969	18	23,124	39	35,921	61	59,045	82	72,014
1980					19,760	23	27,646	43	37,261	57	64,907	77	84,667
1981	11,828	43	15,378	57	27,206	29	29,857	45	36,582	55	66,439	71	93,645
1982	9,075	37	15,439	63	24,514	23	41,113	51	40,125	49	81,238	77	105,752
1983	8,035	46	9,329	54	17,364	17	40,217	47	46,237	53	86,454	83	103,818
1984	10,428	56	8,038	44	18,466	18	34,213	41	48,447	59	82,660	82	101,126
1985	3,153	24	9,899	76	13,052	13	33,032	39	51,809	61	84,841	87	97,893
1986	6,479	30	14,834	70	21,313	22	31,762	41	45,404	59	77,166	78	98,479
1987	7,445	32	15,874	68	23,319	24	38,671	51	36,979	49	75,650	76	98,969
1988	8,484	38	13,822	62	22,306	24	30,522	44	38,803	56	69,325	76	91,631
1989	11,240	46	13,286	54	24,526	22	35,485	41	50,857	59	86,342	78	110,868
1990	16,057	46	18,537	54	34,594	30	34,969	43	46,634	57	81,603	70	116,197
1991	20,851	49	21,793	51	42,644	31	42,315	44	54,166	56	96,481	69	139,125
1992	13,903	58	10,020	42	23,923	22	36,485	43	48,292	57	84,777	79	108,700
1993	14,774	70	6,192	30	20,966	18	41,762	45	51,558	55	93,320	82	114,286
1994	10,673	62	6,608	38	17,281	15	44,312	45	54,820	55	99,132	85	116,413
1995	9,059	66	4,593	34	13,652	14	40,042	47	45,487	53	85,529	86	99,181
1996	9,260	64	5,278	36	14,538	12	45,675	43	59,971	57	105,646	88	120,184
1997	9,832	67	4,806	33	14,638	13	45,036	46	53,707	54	98,743	87	113,381
MEAN	10,622	48	11,396	51	22,018	20	34,774	44	44,529	56	79,303	80	101,321
1987-1996 Mean	12,175	51	11,600	47	23,775	21	39,024	45	48,757	55	87,781	79	111,555

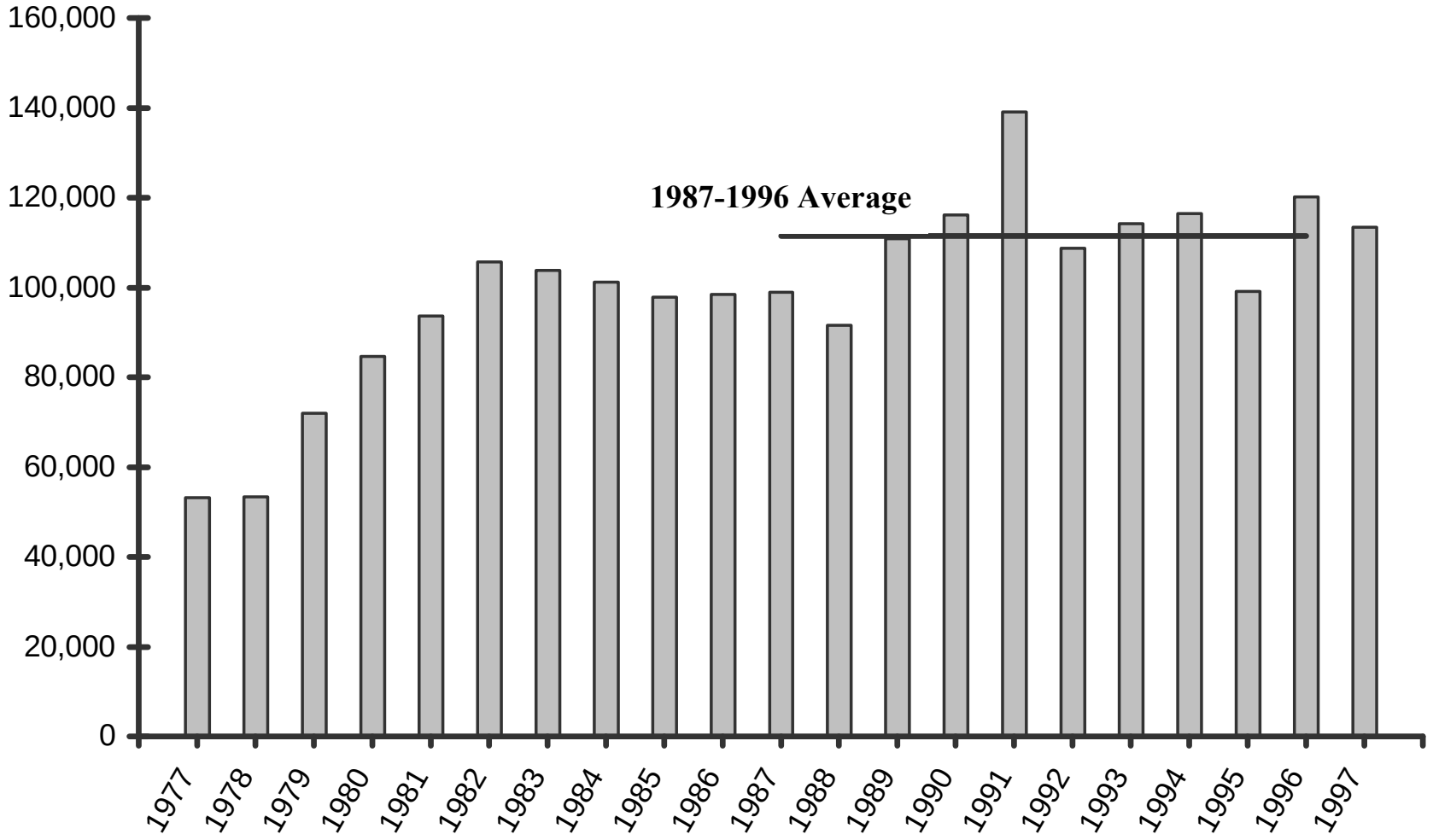

Figure 2.-Angler-days of recreational fishing effort expended by anglers fishing Kodiak Management Area waters, 1977-1997.

Historically, nearly 80% of the total recreational angler effort from the KMA has occurred in the waters of the Kodiak Regulatory Area. From 1977 through 1997, waters of the Kodiak Regulatory Area supported an average of 79,300 angler-days of sport fishing effort (Table 1). In comparison, average sport effort in the Alaska Peninsula/Aleutian Island Regulatory Area from 1977 through 1997 was 22,020 angler-days (Table 1).

The most popular fishery in the KMA in terms of recreational angling effort expended over the past 10 years has been the fresh and marine waters of the Kodiak Road System (Figure 3). Since 1988, these waters have accounted for just over half of the recreational angling effort expended in the KMA. The Buskin River is the most heavily fished stream both along the Kodiak Road System and in the Kodiak Regulatory Area, averaging 18,600 angler-days of fishing effort annually from 1987-1996 (Table 2). Other major freshwater fisheries along the Kodiak road system occur on the Pasagshak, Olds, and American rivers; the various road-accessible lakes near Kodiak; and in the marine waters of Chiniak and Marmot bays (Table 2). Popular fisheries in the remote area include the fresh and marine waters of the Afognak/Shuyak islands group and freshwater fisheries in the Karluk and Ayakulik rivers.

In the Alaska Peninsula/Aleutian Island regulatory area, the fresh and marine waters of Adak Island used to represent the most popular fishery in terms of recreational angling effort expended (Table 3). Prior to closure of the Navy base, the Adak waters averaged 14,280 angler-days per year (1983–1993). Fishing effort in Adak Island waters dropped to only 630 anglers-days in 1997. The major fisheries now include marine and freshwater fisheries around the towns of Unalaska and Cold Bay. In 1997 these fisheries totaled 7,410 angler-days.

RECREATIONAL FISH HARVEST

From 1977 through 1997, an average of 96,570 fish has been harvested (kept) by sport anglers fishing KMA waters (Table 4; Appendices A1-A13). As was the case with recreational angler effort, harvests from KMA waters peaked in 1982. About 45% of the historical sport harvest has been salmon, of which approximately 40% have been pink salmon and 35% coho salmon. Dolly Varden/Arctic char used to contribute the largest single species harvest, accounting for approximately 21% of the historical harvests (Table 4); however, their contribution to the total harvest has significantly dropped in the past few years, and was only 9% in 1997 (Figure 4). In 1997 coho salmon and halibut accounted for 53% of the total harvest (Figure 4).

On average, Kodiak Regulatory Area waters have accounted for 75,160 sport-harvested fish from 1977 through 1997, or 79% of the average KMA sport harvest (Table 5). Dolly Varden, pink and coho salmon, and halibut have accounted for most of the historical sport harvest. From 1977 through 1997, these four species have accounted for an average of approximately 68% of the total sport harvest from Kodiak Regulatory Area waters (Table 5).

Waters of the Alaska Peninsula/Aleutian Islands Regulatory Area have accounted for an average of 21,410 sport-harvested fish from 1977 through 1997 (Table 6), or about 21% of the average KMA sport harvest. Dolly Varden and pink, coho, and sockeye salmon have accounted for most of the historical sport harvest. From 1977 through 1997, these four species have accounted for an average of about 70% of the total sport harvest from Alaska Peninsula/Aleutian Islands Regulatory Area waters (Table 6).

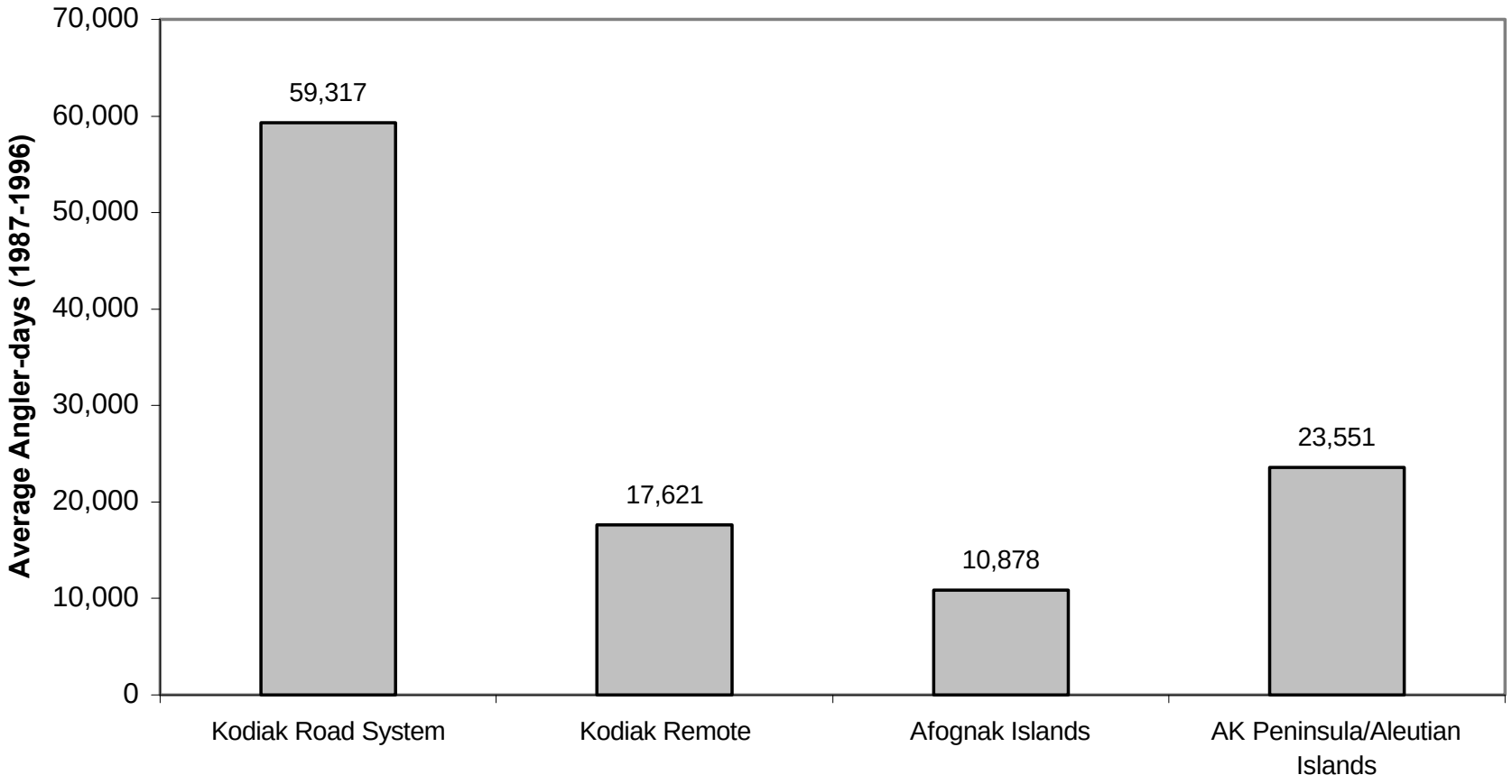

Figure 3.-Recreational fishing effort in Kodiak Management Area waters, 1988-1997, by area fished.

Table 2.-Number of angler-days of effort expended by sport anglers fishing Kodiak Regulatory Area waters, by location, 1983-1997.

Fishery	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Mean (87-96)
Kodiak Road System																
Buskin River & Mouth	18,354	24,108	34,109	24,506	16,481	18,457	26,347	19,560	21,991	15,482	17,072	16,534	14,089	20,015	14,012	18,603
Pasagshak River & Mouth	7,608	4,751	6,117	5,504	5,723	5,111	5,707	8,471	5,876	6,359	4,485	4,907	5,189	6,688	5,931	5,852
Olds River & Mouth	886	3,145	1,200	3,578	1,938	4,147	5,378	3,247	5,583	5,079	5,592	3,438	5,169	4,197	3,907	4,377
American River & Mouth	2,770	1,974	729	4,419	3,622	3,038	3,506	3,359	4,291	3,276	5,006	3,321	3,267	5,140	6,190	3,783
Roadside Lakes	2,918	2,492	1,562	582	1,390	1,677	969	1,666	1,541	2,261	1,186	1,277	1,203	3,384	996	1,655
Saltery Cove Streams													1,368	2,181	2,016	1,775
Other Fresh Waters	3,324	6,257	4,721	3,165	1,607	1,965	3,555	2,172	5,206	3,757	1,226	4,664	3,379	4,990	3,579	3,252
Marine Boat[a]			2,823	9,939	14,868	7,070	9,007	11,547	13,758	15,587	14,556	14,844	15,849	15,348	18,582	13,243
Marine Shore			4,403	7,321	10,110	9,146	9,559	7,115	11,339	7,507	7,234	7,957	4,950	6,703	4,418	8,162
Total	35,860	42,727	55,664	59,014	55,739	50,611	64,028	57,137	69,585	59,308	56,357	56,942	54,463	68,646	59,631	59,282
Kodiak Remote Area																
Karluk River System	2,216	1,339	3,158	1,070	3,919	2,530	2,609	3,393	4,547	5,430	6,894	10,948	6,928	6,237	6,198	5,344
Red River System	554	1,272	91	317	638	377	1,165	815	1,780	3,340	4,566	5,473	1,299	2,038	4,119	2,149
Other Fresh Waters	5,908	2,391	1,352	2,463	2,303	1,552	2,211	3,531	2,864	2,767	4,646	3,469	3,596	5,011	4,852	3,195
Marine Boat	24,042	22,268	11,157	2,168	3,164	2,052	1,738	2,126	4,183	3,332	7,095	9,193	4,584	4,017	9,157	4,148
Marine Shore	16,175	11,945	12,129	2,214	758	1,911	4,348	4,074	3,774	1,109	3,215	2,847	3,847	1,968	2,602	2,785
Total	48,895	39,215	27,887	8,232	10,782	8,422	12,071	13,939	17,148	15,978	26,416	31,930	20,254	19,271	26,928	17,621
Afognak/Shuyak/Barren Islands																
Fresh Water	1,699	718	774	29	0	109	213	718	487	541	885	789	0	90	1,907	383
Marine Boat			486	7,890	6,610	7,163	8,507	7,454	7,003	7,401	8,274	7,901	7,953	7,358	7,277	7,562
Marine Shore			30	2,001	2,519	3,020	1,523	2,355	2,258	1,549	1,388	1,570	2,859	10,281	3,000	2,932
Total	1,699	718	1,290	9,920	9,129	10,292	10,243	10,527	9,748	9,491	10,547	10,260	10,812	17,729	12,184	10,878
Regulatory Area Total	86,454	82,660	84,841	77,166	75,650	69,325	86,342	81,603	96,481	84,777	93,320	99,132	85,529	105,646	98,743	87,781

[a] The Kodiak road zone was established by the Board of Fisheries in 1985. Prior to 1985 all saltwater fishing effort is listed as Remote Area.

Table 3.-Number of angler-days of effort expended by sport anglers fishing Alaska Peninsula/Aleutian Islands Regulatory Area waters, by location, 1983-1997.

Fishery	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Mean (87-96)
Adak Island																
Marine	5,080	6,710	884	1,638	2,033	3,875	4,177	9,187	12,500	3,546	4,314	521	1,184	1,595	63	4,052
Fresh Water	5,445	3,323	5,531	11,694	12,417	11,642	9,569	15,242	14,382	4,862	2,735	524	824	513	565	7,673
Total	10,525	10,033	6,415	13,332	14,450	15,517	13,746	24,429	26,882	8,408	7,049	1,045	2,008	2,108	628	11,725
Unalaska Island																
Marine			816	1,808	1,569	129	541	1,461	3,215	1,452	736	3,642	2,947	4,054	4,622	1,959
Fresh Water			1,596	362	21	197	239	56	1,161	1,218	321	1,381	935	1034	722	630
Total			2,412	2,170	1,590	326	780	1,517	4,376	2,670	1,057	5,023	3,882	5,088	5,344	2,589
Cold Bay																
Marine		212	35	452	1,895	1,376	1,080	870	801	1163	429	2,169	1,404	838	597	1,134
Fresh Water		692	555	1,251	1,132	327	1,320	2,342	2,634	3,094	925	1,916	1,733	1,620	1,468	1,663
Total		904	590	1,703	3,027	1,703	2,400	3,212	3,435	4,257	1,354	4,085	3,137	2,458	2,065	2,797
Other																
Marine		3,506	1,418	2,581	1,948	3,104	5,442	4,539	4,335	7,742	9,265	4,341	3,524	2,773	4,550	4,509
Fresh Water		4,023	2,217	1,527	2,304	1,656	2,158	897	3,616	896	2,211	2,787	1,101	2,111	2,051	1,933
Total		7,529	3,635	4,108	4,252	4,760	7,600	5,436	7,951	8,638	11,476	7,128	4,625	4,884	6,601	6,442
Regulatory Area Total																
Marine		10,428	3,153	6,479	7,445	8,484	11,240	16,057	20,851	13,903	14,774	10,673	9,059	9,260	9,832	11,657
Fresh Water		8,038	9,899	14,834	15,874	13,822	13,286	18,537	21,793	10,020	6,192	6,608	4,593	5,278	4,806	11,894
Total		18,466	13,052	21,313	23,319	22,306	24,526	34,594	42,644	23,923	20,966	17,281	13,652	14,538	14,638	23,551

Table 4.-Number of fish harvested (kept) by sport anglers fishing Kodiak Management Area waters, 1977-1997.

	Salmon					Marine					Freshwater						
Year	Pink	Coho	Sock-eye	Chinook	Chum	Razor Clams	Hali-but	Rock-fish	Ling Cod	Smelt	Dolly Varden	Arctic Grayling	Rain-bow Trout	Land-locked Salmon	Steel-head Trout	Other Fish	Total
1977	14,634	5,722	1,848	1,113	1,869	7,474	994	2,810		9,969	15,900	153	1,747	229	232	5,149	69,843
1978	18,374	6,033	2,241	583	1,619	3,208	1,721	1,907		4,523	16,962	370	1,590	90	162	2,775	62,158
1979	19,698	12,496	4,134	1,176	591	8,363	3,013	3,599		2,515	33,311	209	1,345	373	318	2,227	93,368
1980	30,093	14,319	4,114	723	1,334	11,826	3,651	1,489		4,103	30,685	1,223	3,211	628	671	1,799	109,869
1981	20,650	11,696	4,698	1,264	1,166	3,452	7,711	6,663		3,024	31,482	648	1,653	379	313	6,641	101,440
1982	30,462	14,627	4,532	2,576	2,567	1,944	9,977	4,170		2,620	36,065	707	3,715	712	258	16,651	131,583
1983	12,870	9,678	4,438	1,295	963	2,000	8,809	3,314		0	30,192	136	4,348	954	302	2,077	81,376
1984	17,343	15,892	6,358	1,196	1,609	7,360	9,148	9,347		96	28,528	361	2,828	1,547	696	7,024	109,333
1985	15,426	15,032	8,225	1,133	915	4,970	7,839	4,890		25	22,562	870	3,119	889	790	2,206	88,891
1986	17,365	25,458	6,233	830	541	7,064	11,975	5,165		0	26,459	15	928	726	321	19,742	122,822
1987	13,532	19,402	4,562	1,002	792	2,155	11,465	8,547		462	15,831	594	1,849	1,116	253	10,519	92,081
1988	31,296	21,379	8,853	2,153	1,824	4,614	9,697	13,244		0	22,592	382	964	18	853	8,756	126,625
1989	29,176	23,700	13,173	2,226	941	1,477	11,847	5,325		0	18,635	726	1,861	1,587	788	1,996	113,458
1990	29,997	20,065	8,224	1,156	412	173	11,679	6,519		0	21,052	86	1,528	1,330	1,120	3,983	107,324
1991	20,789	21,327	6,906	2,752	1,676	119	17,309	9,259	2,345	0	21,418	155	1,586	3,982	613	4,552	114,788
1992	11,473	16,920	8,408	2,671	913	973	13,505	6,566	1,753	1,222	11,525	120	1,195	887	96	1,928	80,155
1993	15,570	22,889	10,507	5,738	896	1,286	17,660	8,358	1,120	67	10,233	50	483	3,087	332	2,564	100,840
1994	6,032	14,600	13,502	3,303	380	4,322	17,312	5,743	1,199	0	6,608	41	731	0	243	1,808	75,824
1995	13,185	15,194	9,333	2,859	1,144	0	16,785	4,806	1,007	0	9,263	0	321	67	94	1,771	75,829
1996	7,466	19,773	11,727	2,765	803	1,970	17,982	6,741	832	0	9,779	19	465	0	38	1,741	82,101
1997	6,919	25,491	9,097	5,765	254	533	21,004	7,659	1,524	84	7,922	0	498	0	75	1,379	88,204
Average	18,207	16,747	7,196	2,109	1,105	3,585	11,004	6,006	1,397	1,367	20,334	327	1,713	886	408	5,109	96,567
Percent	19	17	7	2	1	4	11	6	1	1	21	0	2	1	0	5	100

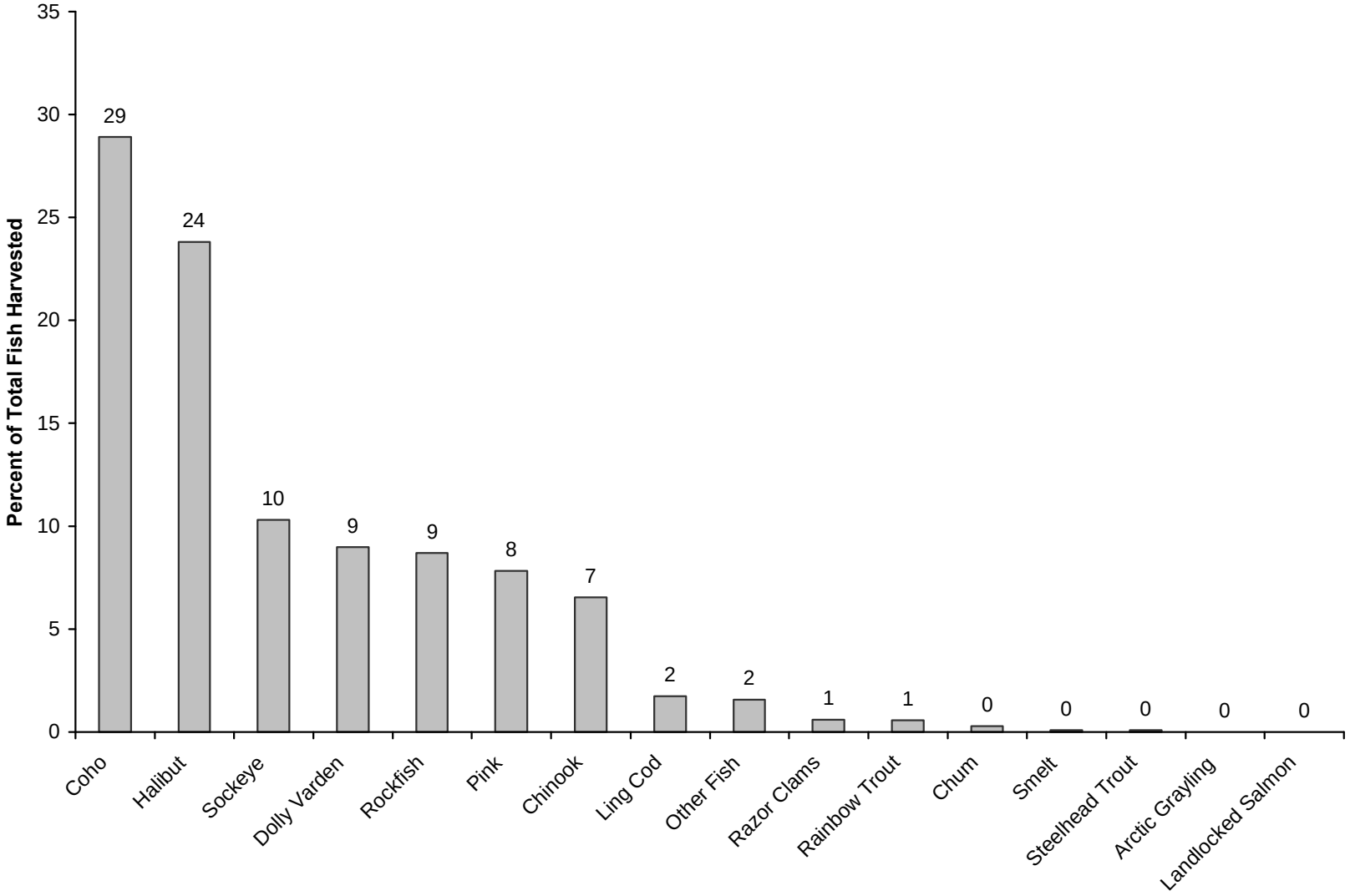

Figure 4.-Composition of harvests by recreational anglers fishing Kodiak Management Area waters, 1997.

Table 5.-Number of fish harvested (kept) by sport anglers fishing Kodiak Regulatory Area waters, 1977-1997.

Year	Pink	Coho	Sockeye	Chinook	Chum	Razor Clams	Halibut	Rockfish	Ling Cod	Dolly Varden	Arctic Grayling	Rainbow Trout[a]	Landlocked Salmon	Steelhead	Smelt	Other Fish	Total
1977	14,519	4,716	1,255	483	1,645	7,474	994	2,810		14,536	54	1,472	229	232	5,652	5,149	61,220
1978	17,739	4,927	1,776	350	1,287	3,208	1,721	1,907		15,805	325	994	90	162	0	2,775	53,066
1979	15,871	11,522	2,436	752	500	8,363	3,013	3,599		25,421	127	972	373	318	943	2,227	76,437
1980	18,969	12,692	2,178	327	525	11,826	3,651	1,489		20,663	465	2,523	628	671	2,092	1,799	80,498
1981	12,259	10,584	1,620	789	637	3,452	6,858	6,242		19,516	119	886	379	313	2,160	5,097	70,911
1982	18,850	13,329	3,055	1,120	1,324	1,944	9,180	3,992		23,771	225	3,380	712	258	2,620	14,188	97,948
1983	8,936	7,823	3,150	729	816	2,000	8,545	3,252		19,439	126	4,296	954	302	0	1,836	62,204
1984	12,779	14,612	5,385	921	1,321	7,360	8,179	8,231		23,092	286	2,592	1,547	696	0	2,181	89,182
1985	13,423	13,625	7,536	762	865	4,970	7,303	4,691		17,516	820	2,564	106	790	25	1,911	76,907
1986	14,509	20,873	5,259	520	336	7,064	10,960	4,479		20,657	15	841	0	321	0	10,922	96,756
1987	11,662	16,912	4,165	379	560	2,155	9,869	6,501		8,763	72	1,448	434	253	462	9,080	72,715
1988	19,044	18,809	6,222	1,564	1,546	4,614	7,749	11,369		18,663	182	855	0	853	0	8,694	100,164
1989	17,794	19,802	6,789	1,087	631	1,477	10,435	5,070		14,266	189	1,534	60	788	0	1,757	81,679
1990	7,464	13,728	6,056	996	191	173	9,134	3,842		14,235	86	1,484	52	1,120	0	2,657	61,218
1991	12,106	17,691	4,937	2,508	1,517	119	12,110	8,215	1,352	13,082	98	1,296	0	613	0	2,995	78,639
1992	5,904	13,668	6,240	2,217	625	973	10,860	5,652	1,454	7,389	120	1,179	151	96	140	1,062	57,730
1993	12,324	21,241	7,849	5,092	504	1,286	14,169	7,569	922	6,299	16	374	0	332	67	1,618	79,662
1994	5,336	12,406	12,502	3,166	290	4,322	14,910	5,019	1,014	5,981	41	731	0	243	0	1,578	67,539
1995	11,926	13,236	7,994	2,622	981	0	13,989	4,247	932	6,469	0	283	0	94	0	1,467	64,240
1996	6,917	16,822	10,158	2,470	692	1,970	14,639	6,207	832	8,292	0	465	0	38	0	1,325	70,827
1997	5,873	23,763	8,259	5,221	235	533	17,594	7,322	1,472	6,916	0	498	0	75	0	988	78,749
Average	12,581	14,418	5,468	1,623	811	3,585	9,327	5,319	1,140	14,799	160	1,460	272	408	674	3,872	75,157
Percent	17	19	7	2	1	5	12	7	2	20	0	2	0	1	1	5	100

[a] Reported rainbow trout harvest from the Karluk and Ayakulik rivers is assumed to be steelhead trout.

Table 6.-Number of fish harvested (kept) by sport anglers fishing Alaska Peninsula/Aleutian Islands Regulatory Area waters, 1977-1997.

Year	Pink	Coho	Sockeye	Chinook	Chum	Halibut	Rockfish	Ling Cod	Dolly Varden	Arctic Grayling	Rainbow Trout[a]	Landlocked Salmon	Smelt	Other Fish	Total
1977	115	1,006	593	630	224	0	0		1,364	99	275	0	4,317	0	8,623
1978	635	1,106	465	233	332	0	0		1,157	45	596	0	4,523	0	9,092
1979	3,827	974	1,698	424	91	0	0		7,890	82	373	0	1,572	0	16,931
1980	11,124	1,627	1,936	396	809	0	0		10,022	758	688	0	2,011	0	29,371
1981	8,391	1,112	3,078	475	529	853	421		11,966	529	767	0	864	1,544	30,529
1982	11,612	1,298	1,477	1,456	1,243	797	178		12,294	482	335	0	0	2,463	33,635
1983	3,934	1,855	1,288	566	147	264	62		10,753	10	52	0	0	241	19,172
1984	4,564	1,280	973	275	288	969	1,116		5,436	75	236	0	96	4,843	20,151
1985	2,003	1,407	689	371	50	536	199		5,046	50	555	783	0	295	11,984
1986	2,856	4,585	974	310	205	1,015	686		5,802	0	87	726	0	8,820	26,066
1987	1,870	2,490	397	623	232	1,596	2,046		7,068	522	401	682	0	1,439	19,366
1988	12,252	2,570	2,631	589	278	1,948	1,875		3,929	200	109	18	0	62	26,461
1989	11,382	3,898	6,384	1,139	310	1,412	255		4,369	537	327	1,527	0	239	31,779
1990	22,533	6,337	2,168	160	221	2,545	2,677		6,817	0	44	1,278	0	1,326	46,106
1991	8,683	3,636	1,969	244	159	5,199	1,044	993	8,336	57	290	3,982	0	1,557	36,149
1992	5,569	3,252	2,168	454	288	2,645	914	299	4,136	0	16	736	1,082	866	22,425
1993	3,246	1,648	2,658	646	392	3,491	789	198	3,934	34	109	3,087	0	946	21,178
1994	696	2,194	1,000	137	90	2,402	724	185	627	0	0	0	0	230	8,285
1995	1,259	1,958	1,339	237	163	2,796	559	75	2,794	0	38	67	0	304	11,589
1996	549	2,951	1,569	295	111	3,343	534	0	1,487	19	0	0	0	416	11,274
1997	1,046	1,728	838	544	19	3,410	337	52	1,006	0	0	0	84	391	9,455
Average	5,626	2,329	1,728	486	294	1,677	686	257	5,535	167	252	614	693	1,237	21,411
Percent	26	11	8	2	1	8	3	1	26	1	1	3	3	6	100

During 1997, sport anglers harvested 88,200 fish from KMA waters (Table 4). This harvest was 9% below the historical average and represented 2.7% and 3.3% of the total statewide and southcentral region sport harvests, respectively, during 1997 (Howe et al. 1998). The largest fisheries in terms of fish harvested during 1997 were for coho salmon, halibut, and sockeye salmon. These species accounted for 29%, 24%, and 10%, respectively, of the total 1997 KMA sport harvest (Figure 4).

RECREATIONAL FISH CATCH-AND-RELEASE

Estimates of the number of fish caught and released by sport anglers fishing KMA waters became available for the first time in 1990 (Mills 1991). Estimates, computed for 1997 using the Statewide Harvest Survey (Howe et al. 1998), show that of the 316,290 fish caught by sport anglers fishing KMA waters, 72% (or 228,700 fish) were released (Table 7). Considerable variability exists in the percent of fish released depending on the species and regulatory area fished (Figure 5). For example, only 51% of the halibut caught by sport anglers in the Kodiak Regulatory Area were released, but 98% of the steelhead were released (Table 7).

COMMERCIAL AND SUBSISTENCE SALMON HARVESTS

Various commercial fisheries also harvest salmon returning to KMA streams. In all cases, harvests in the commercial fisheries (Appendices B1-B5 and C1-C5) are much larger than associated sport fisheries. Fish stocks of the KMA are also harvested in various subsistence fisheries.

ECONOMIC VALUE OF SPORT FISHERIES

There are no direct estimates available to assess the economic value of the recreational fisheries of the KMA. The Jones and Stokes Associates, Inc. (1987) survey of southcentral sport fisheries did not specifically address the sport fisheries of the KMA. A rough approximation of the economic value of the sport fisheries of the KMA can be made by applying the direct expenditures per angler-day values estimated for southcentral Alaska resident and nonresident sport anglers through the Jones and Stokes survey to the estimated sport effort of the KMA (Table 8). Based on this method, the economic value of the sport fisheries of the KMA during 1986 was approximately 12 million dollars. This compares to an estimated value of 127 million dollars for southcentral Alaska sport fisheries during 1986 (Jones and Stokes Associates, Inc. 1987).

STOCKING PROGRAM INVENTORY

Stocking has been used to increase and diversify the opportunities available to sport anglers fishing KMA waters. Various species and life stages have historically been stocked including anadromous chinook smolt and coho salmon fingerlings along with landlocked coho and rainbow trout fingerlings. Nearly all of the stocking has taken place within waters of the Kodiak Road System; however, some stockings have occurred in several remote waters of the KMA (Chignik, Port Lions, Ouzinkie).

During 1998, approximately 1,336,550 hatchery-reared fish were stocked into KMA waters (Table 9). Most of the stockings were anadromous coho salmon smolt in lakes (Figure 6). Of these coho salmon stockings, approximately 1,132,000 were stocked into remote lakes primarily to provide fish for commercial fisheries. However, several landlocked and open lakes along the

Table 7.-Sport harvest and release by species for Kodiak Management Area waters during 1997.

	Kodiak Regulatory Area				Alaska Peninsula/Aleutian Islands Regulatory Area				Total Kodiak Management Area			
Species	Harvest	Release	Total	% Rel.	Harvest	Release	Total	% Rel.	Harvest	Release	Total	% Rel.
Pink Salmon	5,873	38,128	44,001	87	1,046	1,766	2,812	63	6,919	39,894	46,813	85
Coho Salmon	23,763	45,970	69,733	66	1,728	1,990	3,718	54	25,491	47,960	73,451	65
Sockeye Salmon	8,259	21,115	29,374	72	838	504	1,342	38	9,097	21,619	30,716	70
Chinook Salmon	5,221	12,503	17,724	71	544	1,143	1,687	68	5,765	13,646	19,411	70
Chum Salmon	235	6,287	6,522	96	19	190	209	91	254	6,477	6,731	96
Dolly Varden	6,916	39,364	46,280	85	1,006	1,863	2,869	65	7,922	41,227	49,149	84
Other	988	3,864	4,852	80	391	760	1,151	66	1,379	4,624	6,003	77
Rainbow Trout	498	3,421	3,919	87	0	281	281	100	498	3,702	4,200	88
Steelhead Trout	75	3,217	3,292	98	0	0	0		75	3,217	3,292	98
Halibut	17,594	18,578	36,172	51	3,410	4,961	8,371	59	21,004	23,539	44,543	53
Rockfish	7,322	18,064	25,386	71	337	1,526	1,863	82	7,659	19,590	27,249	72
Lingcod	1,472	2,846	4,318	66	52	359	411	87	1,524	3,205	4,729	68
Total[a]	78,216	213,357	291,573	73	9,371	15,343	24,714	62	87,587	228,700	316,287	72

From: Howe et al. 1998.

[a] Totals do not include razor clams or smelt, so do not match totals in Tables 4, 5 and 6.

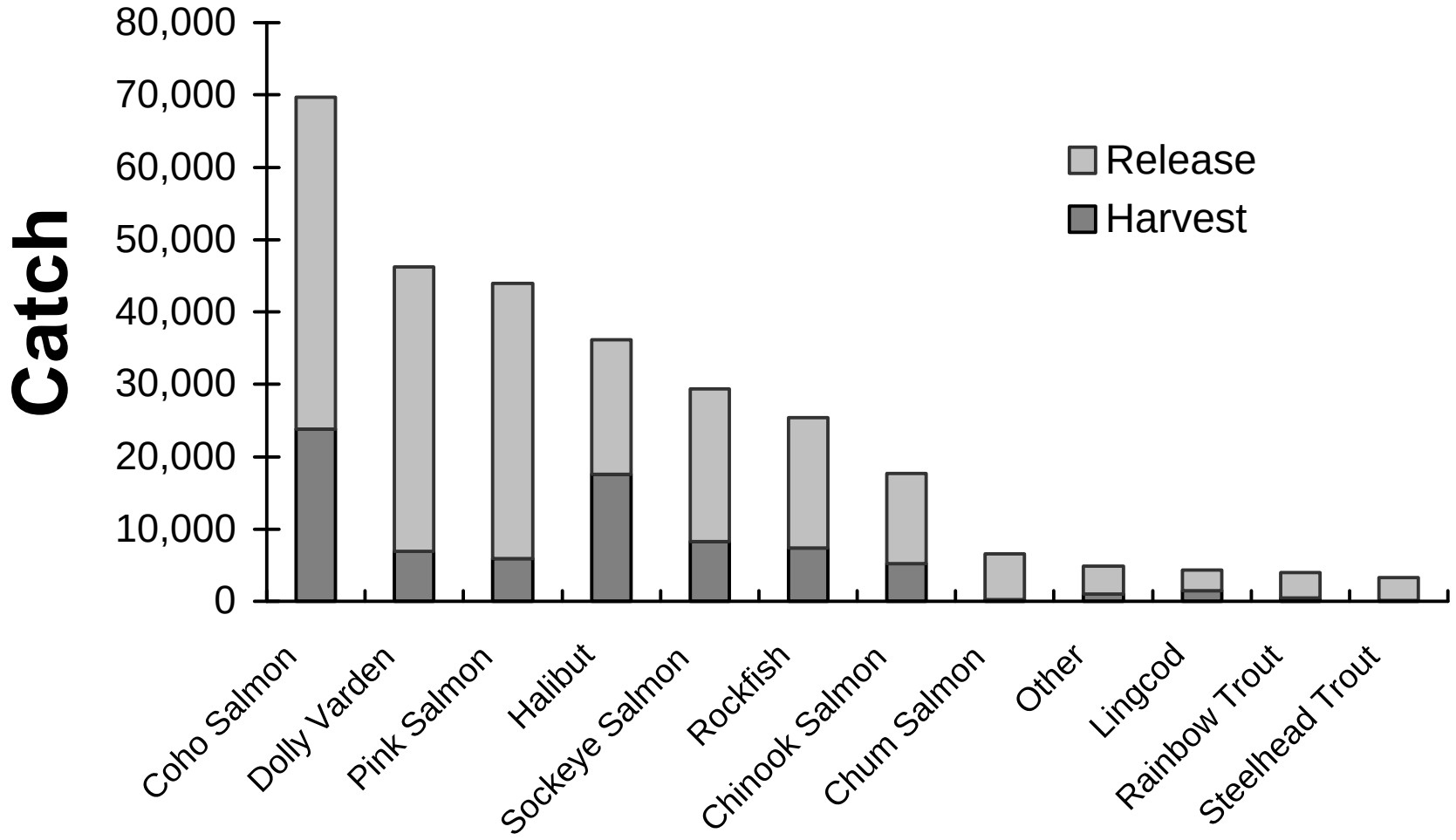

Figure 5.-Number of fish kept and released, by species, by recreational anglers fishing Kodiak Regulatory Area waters during 1997.

Table 8.-Estimated economic value of KMA sport fisheries during 1986.

Angler Type	SOUTHCENTRAL ALASKA			KODIAK MANAGEMENT AREA		
	Angler-Days[a]	Expenditures[b]	$/Ang-Day	Angler-Days[a]	$/Ang-Day[c]	Expenditures
Resident	1,153,660	$ 74,163,000	$ 64.29	68,936	$ 64.29	$ 4,431,549
Non Resident	201,488	$ 52,892,000	$262.51	29,473	$262.51	$ 7,736,867
BOTH	1,355,148	$127,055,000	[d]	98,479	[d]	$12,168,416

[a] From Mills 1987.

[b] From Jones and Stokes Associates, Inc. 1987.

[c] Computed from southcentral Alaska sport fisheries.

[d] Not computed.

Kodiak road system are also stocked with coho. In addition to coho, 56,000 rainbow trout fingerlings were stocked in 21 landlocked lakes along the Kodiak Road System. These stockings were aimed at providing fish for recreational anglers.

ONGOING RESEARCH AND MANAGEMENT ACTIVITIES

There are four major research activities ongoing in the KMA. The first involves continued operation of the Buskin River weir to determine the numbers and age, sex, and length compositions of the coho and sockeye salmon immigrations to the Buskin River.

A second research program initiated in 1992 involves the dockside sampling of recreationally-harvested groundfish at the Kodiak boat harbor. This program has the objective of defining the species composition and age, sex, and size compositions of recreationally-harvested groundfish harvests returning to the Kodiak boat harbor. The long-term goal of this project is to determine important life history characteristics of these species to assess the long-term health and sustained yields of these stocks. During the 1994 season an additional element was added to this marine catch sampling project. Chinook salmon harvested by saltwater anglers were checked for adipose finclips, indicating the presence of a coded wire tag. The ratio of clipped fish to unclipped fish was documented. The fish that had clips had coded wire tags removed so their stream of origin could be determined.

A third research program, initiated in June 1993, deals with the chinook salmon populations in the KMA, primarily the Karluk, Ayakulik and Chignik rivers. Age, sex and size data were collected from the Karluk and Ayakulik rivers escapement. Also on these two rivers, rafters were censused at the weir for chinook catch and effort data. In Chignik, the commercial chinook purse seine catch from the lagoon was sampled for age, sex and size data. These Chignik data are assumed to be similar to that of the escapement.

Table 9.-Releases of hatchery-reared fish into KMA waters, 1991-1998.

Species/ Size		1991	1992	1993	1994	1995	1996	1997	1998
R. Trout	Horseshoe L.	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fingerling	Jack L.	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Aurel L.	3,000	3,000	3,000	3,000	3,000	2,800	3,000	3,000
	Big L.	3,600	1,800	3,600	7,950	4,000	7,000	3,600	3,600
	Tanignak L.	6,000	0	6,000	6,000	6,000	6,000	6,000	6,000
	Bull L.	2,000	2,000	2,000	2,000	2,000	2,400	2,000	2,100
	Cascade L.	3,300	800	3,300	0	3,300	3,300	3,300	3,300
	Lee L.	2,800	2,800	2,800	2,800	2,800	3.000	2,800	2,800
	Twin L.	4,000	4,000	4,000	4,000	4,000	5,000	4,000	1,500
	Lilly L.	900	800	1,600	5,100	1,730	2,000	1,600	1,600
	Heitman L.	3,300	800	3,250	0	3,250	3,250	3,250	3,250
	Long L.	3,600	900	0	3,600	3,600	3,600	3,600	3,600
	Caroline L.	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,600
	Lupine L.	1,600	1,600	1,600	1,600	1,600	2,000	1,600	2,100
	Dragon Fly L.	1,500	1,600	1,550	1,500	1,550	1,550	1,550	1,750
	Cicely L.	1,200	1,200	1,150	1,150	1,150	1,400	1,150	1,400
	Abercrombie	3,700	3,200	3,700	8,350	6,300	4,000	3,700	3,700
	Margaret L.	1,700	800	1,600	6,850	1,730	2,000	1,600	1,600
	Jupiter L.	3,600	900	3,600	0	3,600	3,600	3,600	3,600
	Saturn L.	2,400	600	2,400	0	2,400	2,400	2,400	2,400
	Dolgoi L.	5,200	1,300	5,150	5,150	5,150	3,200	5,150	5,150
	Chignik L.	5,000	5,000	0	5,000	5,000	5,000	0	0
	Rainbow Total	61,800	31,500	53,700	62,450	65,560	66,900	87,000	56,050
Chinook	Island L.	56,000	94,700	66,950	90,700	0	0	0	0
Smolt	Mission L.	31,000	0	0	0	0	0	0	0
	Buskin River	0	0	0	0	83,758 [a]	103,800	0	0
	Chinook Total	87,000	94,700	66,950	90,700	83,758	103,800	0	0
Arctic	Aurel L.	20,000	20,000	20,000	20,000	0	0	0	0
Grayling	Cascade L.	10,000	10,000	10,000	10,000	0	0	0	0
Fry	Cicely L.	10,000	10,000	10,000	10,000	0	0	0	0
	Heitman L.	30,000	30,000	30,000	30,000	0	0	0	0
	Grayling Total	70,000	70,000	70,000	70,000	0 [b]	0	0	0

-continued-

Table 9.-Page 2 of 2.

Species/ Size		1991	1992	1993	1994	1995	1996	1997	1998
	Anadromous								
Coho	Mayflower L.	6,500	3,250	16,000	16,400	3,810	0	13,200	16,300
Fingerling	Island L.	22,500	22,500	16,000	47,400	23,520	14,000	53,200	51,500
	Dark L.	7,500	7,500	8,000	18,000	12,570	0	19,700	17,300
	Mission L.	12,700	7,500	8,000	30,200	20,280	14,000	27,900	27,800
	Orbin L.	5,100	3,750	8,000	0	0	0	0	0
	Kalsin L.	19,340	8,200	8,000	0	0	0	0	0
	Potatoe Patch L.	9,500	7,500	0	20,000	4,860	0	23,200	21,600
	Ouzinkie L.	15,000	15,000	13,000 [d]	16,000	15,000	17,000	16,000	14,000 [d]
	Crescent L.[c]	69,000	69,000	164,000 [d]	168,000	163,000	185,000	166,000	163,000
	Big Kitoi Creek [c]	614,000	107,000	259,000	894,000	819,000	894,000	820,000	769,000 [e]
	Little Kitoi L. [c]	71,000	139,000	0	0	0	0	0	0
	Jenifer L. [c]	162,000	135,000	0	185,000	0	163,000	163,000	165,000
	Ruth L. [c]	0	0	0	60,000	0	35,000	35,000	35,000
	Subtotal remote	916,600	450,000	423,000	1,307,000	982,000	1,277,000	1,184,000	1,132,000
	Subtotal road	98,140	75,200	77,000	148,000	80,040	45,000	153,200	148,500
	Subtotal both	1,014,140	525,200	500,000	1,455,000	1,062,040	1,322,000	1,337,200	1,280,500
	Landlocked								
Coho	Pony L.	2,400	0	0	4,200	3,238	0	4,200	0
Fingerling	Southern L.	0	0	0	0	2,857	0	6,800	0
	Total	2,400	0	0	4,200	6,095	0	11,000	0
All Coho	Total	1,016,540	510,200	500,000	1,459,200	1,068,135	1,322,000	1,348,200	1,280,500
All Species	GRAND TOTAL	1,235,340	706,400	690,650	1,682,350	1,217,453	1,492,700	1,435,200	1,336,550

[a] These fish were from Willow Creek brood stock, 39,161 of which were coded wire tagged. Prior to 1995 the brood stock was from Crooked Creek, and smolt were not tagged.

[b] Project terminated in 1995 because stocking did not generate a fishery.

[c] Remote location outside of the Kodiak Road System.

[d] Presmolt.

[e] Smolt.

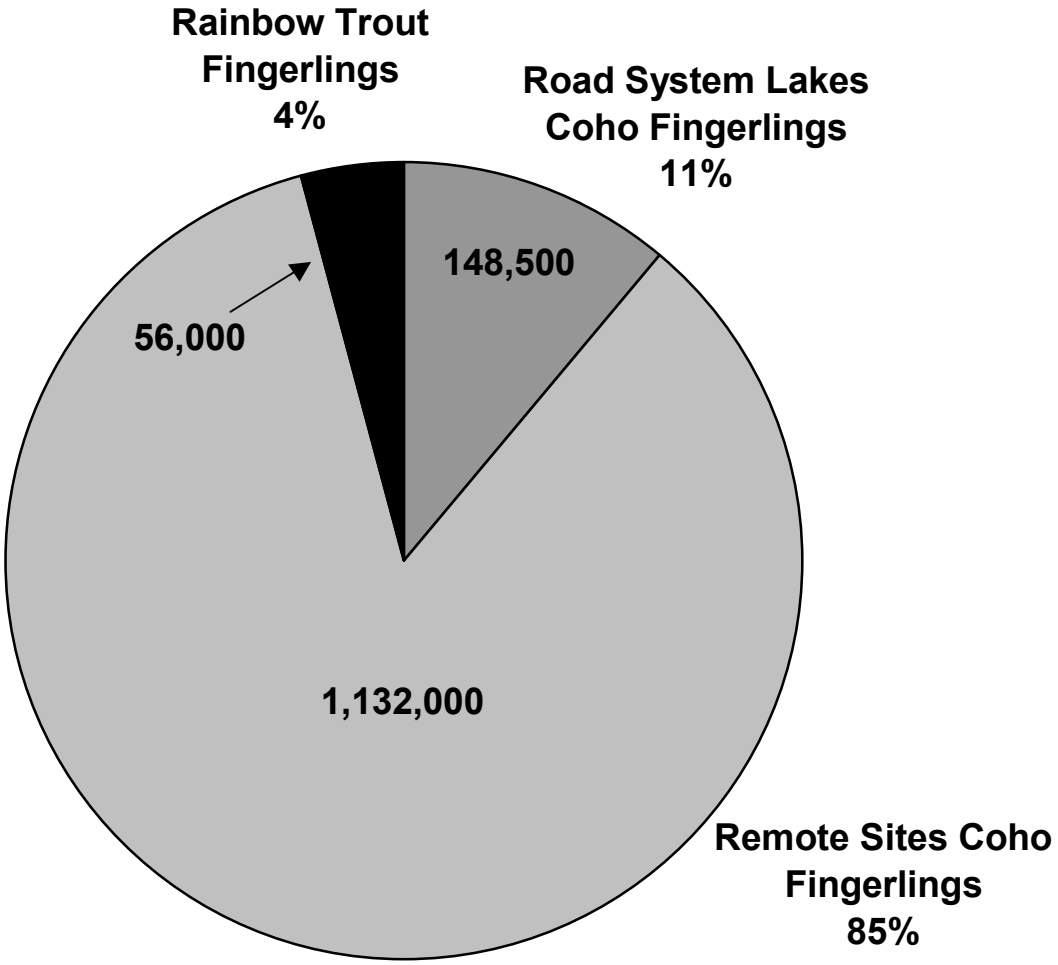

Figure 6.-Stockings of hatchery-reared fish into Kodiak Management Area waters during 1998.

Finally, a fourth project, directed towards Kodiak road system coho, was initiated in 1997. This project is evaluating the effectiveness of using escapement surveys conducted on foot to monitor coho escapement into index streams. Two years of population estimates using the mark-and-recapture technique have been conducted on the American and Olds rivers. Comparing the foot survey counts to the population estimates will determine if survey counts are an effective way to monitor spawning escapement in index streams. In addition to this research the project also allows monitoring of coho sport fisheries. In 1997 a creel survey was conducted on the Nateekin River in Unalaska and in Perenosa Bay on Afognak Island.

There are several routine management activities that are ongoing in the KMA. These activities include:

1. Participation in the Alaska Board of Fisheries process,
2. Fishery monitoring and inseason fishery management (a list of emergency orders issued for KMA fisheries from 1989 through 1995 is presented in Appendix H),
3. Involvement with the public,
4. Habitat monitoring and permit review, and
5. Annual fish stockings.

ACCESS PROGRAMS

The Federal Aid program stipulates that a portion of the federal funds passed on to states be used to increase opportunities for angler access to sport fisheries.

As various Native Corporations and private landowners begin to develop their land use plans on Kodiak Island, the need to ensure public access becomes more critical. As a result a list of prioritized objectives was developed. These are listed below:

1. Construct a new boat launch ramp in Anton Larsen Bay,
2. Improve parking lot adjacent to the Anton Larsen Bay boat ramp,
3. Secure access along the Olds and American rivers,
4. Secure access along the Karluk River,
5. Secure access along the Ayakulik River,
6. Secure access in Afognak Lagoon,
7. Secure access for Cascade Lake near Anton Larsen Bay, and
8. Determine the land status of stocked lakes along the Kodiak Road System and pursue securing access.

During the fall of 1994 construction of the parking lots along the Russian, Olds, American, and Buskin rivers was initiated, and work was completed in 1995. An extension of the existing Anton Larsen Bay boat launch ramp was also completed in 1995.

MANAGEMENT AREA FISHERY OBJECTIVES

The Division of Sport Fish recommended several priority criteria to guide the establishment of fishery objectives (internal memo from Norval Netsch, Sport Fish Director, to Carl Rosier, Fish and Game Commissioner, dated 3/27/91). These include:

1. **Management and protection of existing fish resources**. This criterion directs that divisional activities should strive to manage and protect Alaska's wild stocks of fish resources for future generations.
2. **Public use and benefits of existing fish resources**. This criterion directs that divisional activities should strive towards making Alaska's fishery resources available for public use and benefit on a sustained yield basis.
3. **Rehabilitation of depressed stocks and damaged habitat**. This criterion directs that divisional activities should strive to restore and maintain fish habitat damaged by man's activities.
4. **Enhancement of natural production or creation of new opportunities**. This criterion directs that the division should pursue creation of new sport fishing opportunities through rehabilitation of natural stocks or creation of new fisheries where these opportunities do not negatively affect other fisheries.

To date, no specific fishery objectives have been developed for KMA sport fisheries. We anticipate that specific objectives will be developed in the near future. Participation of the public in the development of these objectives is desired and will be solicited.

Although no specific fishery objectives have been established to date, an assumption of past and current fisheries management has been to assure the sustained yield of the various fisheries stocks that occur within the KMA, while assuring continued and, where possible, expanded opportunity to participate in fisheries targeting these stocks.

MAJOR BIOLOGICAL AND SOCIAL ISSUES FOR THE KMA

Compared to other management areas in Region II, there are relatively few major biological or social issues surrounding the KMA sport fisheries. The few major issues that do exist are as follows:

1. Development of the Saltwater Sport Fishery for Chinook. A directed saltwater troll fishery for chinook began to develop in 1993 in Chiniak Bay near the town of Kodiak. Concerns about how this fishery is to develop have been expressed by commercial salmon users, charter boat operators, and private anglers. Lengthy meetings (advisory committee meetings; advisory committee appointed work groups; Board of Fisheries teleconferences, public hearing, special meetings; as well as various association meetings) were held to discuss development of this fishery which targets mixed stocks of unknown origin. Annual limits have been the main management tool discussed so far, but discussions on development of this fishery are still ongoing within the Board of Fisheries process.
2. Kodiak Road System Chinook and Coho salmon enhancement programs. The department has released chinook smolt along the road system in various locations in an attempt to provide for a chinook salmon sport fishery. For various reasons these attempts have failed. The department is currently developing a chinook enhancement plan that will provide for a

sport fishery on the road system that is in compliance with genetic, pathology, fisheries management, and environmental concerns. Developing this program will take the cooperation of the department, the local aquaculture association, as well as the Kodiak Sportfishing Association.

The coho enhancement program on the Kodiak road system was very successful through 1996, producing returns that generated a significant sport fishery. Since 1997 returns have been poor and angling effort has dropped off as a result. The main reason for poor returns is thought to be the small size of coho fingerlings at release. When the program was successful, fingerlings were obtained from the Kitoi Bay hatchery and averaged over a gram in weight. The Pillar Creek hatchery has been providing smolt since 1994 and average weights have averaged under 0.5 grams. Pillar Creek hatchery does not have the space to rear the fingerlings to a gram in weight prior to release. If additional rearing space can be provided, the average release weight could be increased and the program would probably be successful once again.

3. Kodiak Road System Salmon Escapements. The Kodiak Road System is the most heavily fished area on the entire island, accounting for over half of the angler-days in the Kodiak Management area. There are several small coho stocks located along the road system which are susceptible to overharvest due to their small size (Salonie Creek, American River, Olds River, and Roslyn Creek). Coho escapement into these streams should be monitored to ensure these small stocks don't become overharvested and decline in abundance. The effectiveness of using foot surveys to monitor coho returns into the Pasagshak system also needs to be evaluated.

3. Access. As land on Kodiak Island is conveyed to Native corporations and as private landowners develop their land management plans, obtaining public access and department access needs to become a main priority. If access is not assured, the department will not be able to carry out its management responsibilities and the public will not have access to fishery resources. The department needs to secure a lease to operate the Karluk River weir.

   The department published a brochure in cooperation with the Department of Natural Resources explaining the land status along the Karluk River. A similar brochure should be developed for the Ayakulik River, so the public will know what land is public and private and how to access the river without trespassing.

   In addition to weir leases and informational brochures, the department should secure public access through leases, easement, or purchase in heavily used or strategic locations. The department is in the process of securing public access along the American and Olds rivers.

SECTION II: MAJOR FISHERIES OVERVIEW

Section II provides a more detailed summary of all major fisheries that occur in the Kodiak Management Area. Included in this section are a description and historical perspective of each fishery, the objective governing the management of each fishery, description of the recent performance of each fishery, a description of recent Board of Fisheries actions with respect to each fishery, a description of any social or biological issues surrounding each fishery, and a description of any ongoing or recommended research or management activities directed at each fishery. Inseason management approach and/or outlook are presented if applicable.

KODIAK ROAD ZONE FISHERIES

The Kodiak road zone includes all fresh waters on Kodiak Island east of a line extending southward from Craig Point on the west side of Anton Larsen Bay to the westernmost point of Saltery Cove, and all saltwater bays and all salt waters within 1 mile of all points of land within the freshwater area described above including Spruce, Woody and Long islands (Figure 7). All fisheries in this area can be accessed by road or small boat launched from the City of Kodiak.

Over the past 10 years (1988–1997), the waters of the Kodiak road zone supported the most popular fisheries in the KMA in terms of recreational angling effort expended. Since 1988, these waters have accounted for 66% of the recreational angling effort expended in the Kodiak regulatory area and 54% of the effort in the KMA. The Buskin River is the most heavily fished stream both along the Kodiak road zone and in the Kodiak Regulatory Area, averaging over 18,000 angler-days of fishing effort annually (Table 2).

There are five major freshwater fisheries that occur in the waters of the Kodiak road zone. These fisheries target Dolly Varden, coho salmon, pink salmon, sockeye salmon, and stocked fish in landlocked lakes. Saltwater fisheries along the road target salmon, halibut and rockfish.

KODIAK ROAD ZONE DOLLY VARDEN FISHERY

Fishery Description and Historical Perspective

Dolly Varden are available to anglers throughout the year along the Kodiak road zone, however, peak fishing opportunities typically occur as the fish migrate from overwintering areas (Buskin, Saltery and Pasagshak lakes) and to spawning areas (Buskin, American, Olds, and Pasagshak rivers). Peak harvest typically occurs in May and from mid-July through September. Spawning begins in September and continues into November.

All streams along the Kodiak road zone are open continuously to fishing for Dolly Varden, with the exception of an area on the Buskin River extending 300 feet downstream and 300 feet upstream of the Buskin River weir which is closed to fishing when the weir is in operation. The daily bag and possession limits are 10 Dolly Varden with no size limit.

From 1987 through 1996, the waters of the Kodiak road zone accounted for an average harvest of 7,235 Dolly Varden (Table 10). This harvest represented an average of about one-half of the total KMA Dolly Varden harvest over this period. Major sport fisheries for Dolly Varden in the Kodiak road zone include Buskin, Pasagshak, American, and Olds rivers. Since 1988, these four river systems have accounted for an average of 64% of the total road zone Dolly Varden harvest. Of these systems, the Buskin River has supported the largest fishery for Dolly Varden

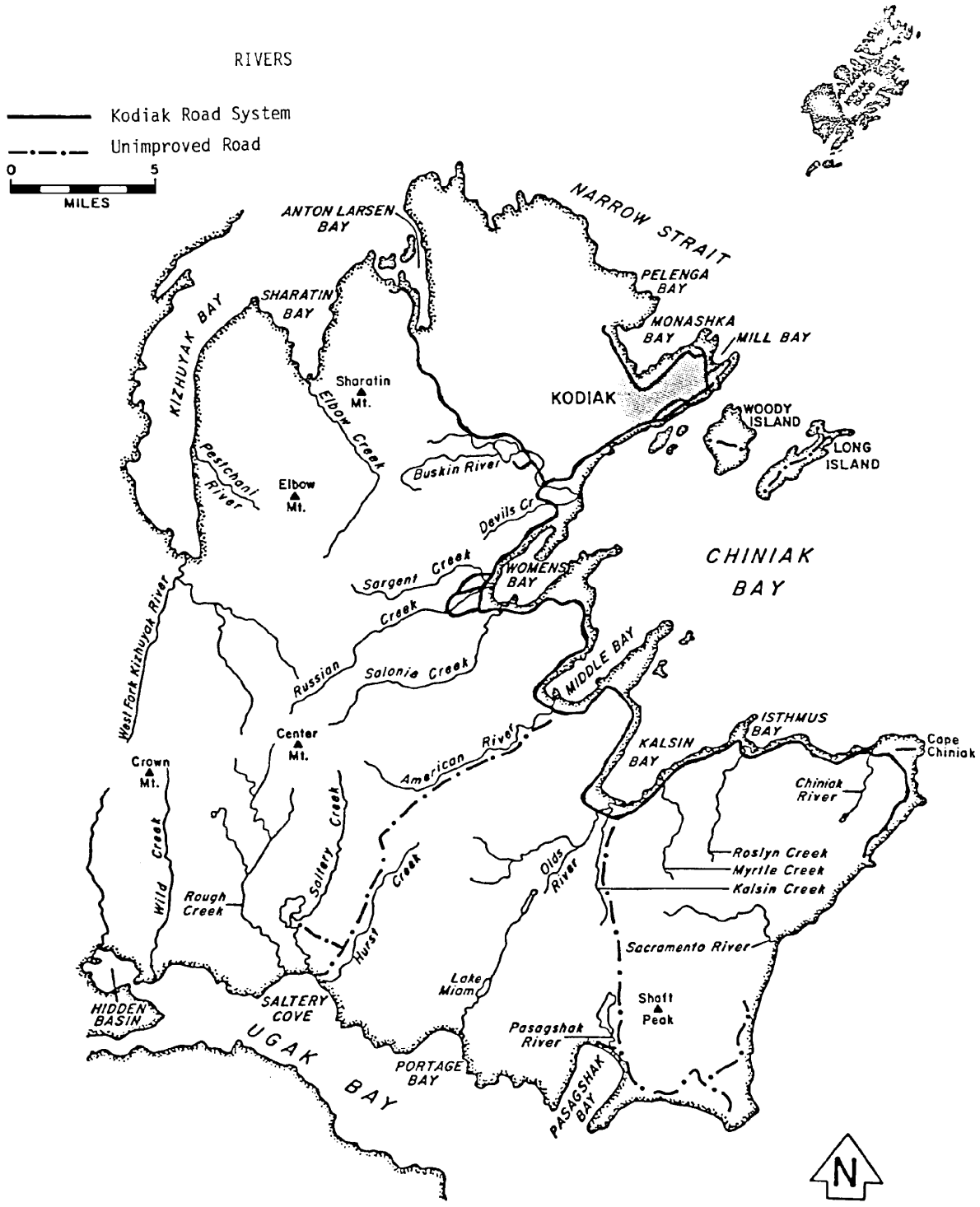

Figure 7.-Geographic boundaries of the Kodiak road zone.

Table 10.-Harvest and release of Dolly Varden from Kodiak road zone waters of the Kodiak Management Area, 1987-1997.

Year	KMA Harvest	Kodiak Road System Harvest	Kodiak Road System Release	Kodiak Road System % of KMA Harvest
1987	15,831	7,859		50
1988	22,592	12,482		55
1989	18,635	10,470		56
1990	21,052	9,558	19,853	45
1991	21,418	9,718	9,447	45
1992	11,525	4,572	19,498	40
1993	10,233	3,955	22,577	39
1994	6,608	4,130	13,956	63
1995	9,263	4,723	11,078	51
1996	9,779	4,880	19,647	50
1997	7,922	4,212	17,619	53
1987-1996 Average	14,694	7,235	16,579	49

Note: The Kodiak road zone totals were calculated by adding numbers from the SWHS listed for the Buskin, American, Olds, Pasagshak, and Saltery rivers; roadside lakes; Chiniak Bay and shore; Mill Bay beach; and any harvest or release included in the other roadside streams category.

Since 1988, the average harvest of Dolly Varden from the Buskin River has been 3,070 fish (Table 11), making this river the largest in terms of numbers of Dolly Varden harvested in the KMA.

A research project to assess the structure and status of the Buskin River Dolly Varden stocks was initiated during the early 1980s. As part of this work, fishery and migration statistics were estimated (Table 12). From 1984 through 1990, creel surveys documented that anglers fishing the Buskin River during the spring Dolly Varden emigration expended an average of 4,390 angler-days of effort to harvest 5,530 Dolly Varden. From 1988 through 1990, these surveys also collected information on released fish and documented that anglers fishing during the spring emigration caught and released an average of 4,880 Dolly Varden (Table 12). From 1985 through 1992, an average of 44,430 and 24,850 Dolly Varden were counted emigrating from and immigrating into the Buskin River, respectively. Complete weir counts on emigrating and immigrating Dolly Varden are not available after 1992.

Table 11.-Harvest of Dolly Varden from selected Kodiak road zone streams, 1977-1997.

	Buskin River		Pasagshak River		American River		Olds River		Total	
Year	Harvest	Release	Harvest	Release	Harvest	Release	Harvest	Release	Harvest	Release
1977	10,353		617						10,970	
1978	8,003		443						8,446	
1979	15,150		982						16,132	
1980	9,159		475						9,634	
1981	9,376		1,162						10,538	
1982	10,167		692						10,859	
1983	8,454		1,332		126		10		9,922	
1984	9,477		1,072		848		249		11,646	
1985	10,261		152		46		91		10,550	
1986	10,367		933		107		321		11,728	
1987	4,238		688		417		290		5,633	
1988	5,293		1,055		800		200		7,348	
1989	7,092		618		448		259		8,417	
1990	4,209	11,471	138	2,363	845	1,380	293	1,087	5,485	16,301
1991	4,337	7,623	1,124	1,398	375	245	288	260	6,124	9,526
1992	2,319	8,258	352	1,106	360	3,605	360	893	3,391	13,862
1993	1,150	4,346	194	1,316	115	6,261	468	1,919	1,927	13,842
1994	1,208	3,481	205	726	671	5,144	358	1,142	2,442	10,493
1995	1,969	5,767	294	414	631	1,111	392	567	3,286	7,859
1996	1,740	7,963	191	1,276	921	3,437	353	1,123	3,205	13,799
1997	1,376	6,822	57	441	777	5,437	339	814	2,549	13,514
1988-1997 Average	3,069	6,966	423	1,130	594	3,328	331	976	4,417	12,400

Recent Fishery Performance

The sport harvest of Dolly Varden from Kodiak road zone waters during 1997 was 4,210 fish, 42% below the recent 10-year mean harvest for the area (Table 10). Although the harvest was the second lowest on record, catch figures remained high at almost 22,000 fish, indicating that anglers were choosing to release over 80% of the fish they were catching (Table 10). The Buskin River again supported the largest harvest of Dolly Varden on the road system (Table 11).

Management Objectives

Management objectives for this fishery are to provide angling opportunities at a level that can be supported by the resource.

Table 12.-Fishery and migration statistics for the Buskin River Dolly Varden resource, 1981-1993.

		April 15-Jun 15[a]			Entire Year[b]		Weir Counts	
Year	Reference	Effort (Ang-Days)	Harvest	Release	Harvest	Release	Emigration	Immigration[c]
1981	Murray 1982		8,437		9,376			
1982					10,167			
1983	Murray 1984		6,668		8,454			
1984	Murray 1985	3,410	5,460		9,477			
1985	Murray 1986		8,712		10,261		21,797	20,545
1986	Murray 1987	4,284	4,065		10,367		40,773	24,110
1987	Murray 1988a	4,619	4,766		4,238		29,919	32,848
1988	Murray 1989	4,523	3,569	5,067	5,293		31,260	34,306
1989	Murray 1990	5,204	5,761	5,567	7,092		35,605	30,851
1990	Whalen 1991	4,268	2,362	3,993	4,209	11,471	91,107[d]	6,416[e]
1991	Whalen 1992				4,337	7,623	30,725[d]	[f]
1992	Whalen 1993				2,319	8,258	74,451[d]	[f]
1993					1,150	4,346	[f]	[f]
Mean		4,385	5,533	4,876	6,672	7,925		28,532

[a] Data from creel survey conducted during the emigration period only.

[b] Information from Statewide Harvest Survey (Mills 1982-1994).

[c] Immigration counts stopped when weir operation stopped on approximately October 1. Fish continue to migrate through October and November, so the counts listed here are partial counts of the total immigration.

[d] Vexar mesh was placed over the weir during emigration in these years, insuring fish over 210 mm total length could not pass through the weir pickets uncounted. In previous years, fish under 300 mm total length could pass through the weir uncounted.

[e] Partial count due to weir washout, not included in mean.

[f] The weir was not operated during the peak immigration period.

Recent Board of Fisheries Actions

During the 1987 Alaska Board of Fisheries meeting, the Board reduced the bag and possession limits for Dolly Varden from 20 to 10 fish daily and in possession. This change was adopted to prevent overharvest of Dolly Varden stocks that are found within the Kodiak road zone.

During the 1999 Board of Fisheries meeting, the Board adopted a proposal that established criteria to follow when designating or dealing with special management areas that would diversify sport fishing opportunity for populations of wild Dolly Varden, (such as catch-and-release, fly-fishing only, or trophy designation).

In making determinations on regulatory proposals designating and dealing with special management areas for Dolly Varden, the Board will consider the following criteria (5 AAC 64.014):

1. stock status: the body of water must contain Dolly Varden populations that are naturally reproducing and possess some unique characteristic; the Dolly Varden populations must be shown to have maintained historical size and age composition, and numbers of Dolly Varden, or the area must have retained the habitat attributes necessary to allow these population characteristics to return to historical levels;
2. history of quality fishing: a body of water that the public perceives as having provided "quality" Dolly Varden fishing will be preferred over a body of water that is not so perceived;
3. proximity to a community: to avoid conflict with traditional consumptive use patterns by local residents, a body of water located near enough to a permanent community to be commonly used or visited by local residents will not be preferred, unless the establishment of the body of water as a special management area is requested or supported by the community;
4. legal access: a body of water with more than 50 percent of its uplands publicly owned or that is determined to be navigable will be preferred;
5. conflict with freshwater net fisheries: a body of water with a Dolly Varden fishery that is seasonally or spatially segregated from subsistence, personal use, and commercial net fisheries will be preferred;
6. abundance and size of the Dolly Varden population: a body of water with unusually high numbers of Dolly Varden, with uniquely large Dolly Varden, or documented as having Dolly Varden that have been entered in the department's trophy fish program will be preferred;
7. clear geographical boundaries: a body of water with clearly distinguishable legal regulatory boundaries will be preferred;
8. relative economic importance of the wild Dolly Varden fishery: a body of water with a Dolly Varden fishery of high economic value to the state will be preferred;
9. geographical distribution of special management waters: the proximity of a body of water to other special management waters and the availability of alternative locations not designated for special management; and
10. special research or educational needs: the need for a body of water for special management research or educational reasons.

Current Issues

Emigration counts from the Buskin River drainage were 91,107, 30,725 and 74,451 Dolly Varden in 1990, 1991 and 1992, respectively (Table 12). We do not know if the decrease of 60,000 fish in 1991 was due to a large decrease in population size or if the population overwintered outside the Buskin drainage during the winter of 1990-1991. Research to answer these concerns was conducted in the fall of 1993 and is discussed below.

Ongoing Research and Management Activities

A major research program was conducted from 1986 to 1993 (Murray 1986, 1987, Sonnichsen 1990, Whalen 1991, 1992, 1993) to assess the stock structure and sustainable yield of Dolly Varden in the Chiniak Bay area. Work included operation of weirs to count emigrating Dolly Varden from Buskin, Genevieve and Louise lakes and mark-recapture experiments to determine population size and stock structure.

Results of this work showed that Chiniak Bay Dolly Varden exhibit a similar life history to that documented for anadromous Dolly Varden in southeastern Alaska. Buskin Lake appears to provide the major overwintering site for Chiniak Bay Dolly Varden stocks. Dolly Varden migrate out of Buskin Lake during the spring and reside primarily in marine waters during the summer. During late summer and fall, they enter streams in the Chiniak Bay area to feed and/or spawn. While the Buskin drainage is the major overwintering site, it is not the only spawning system. Other major spawning locations for Dolly Varden that overwinter in Buskin Lake include the American and Olds rivers; both of which are tributaries of Chiniak Bay. Throughout late summer and fall, Dolly Varden return to Buskin Lake to overwinter. Because of these life history characteristics, the Dolly Varden of Chiniak Bay can be considered one stock for purposes of fisheries management.

The point estimate of 5,881 spawning fish in 1993 was the highest ever recorded for the American River, although its 95% confidence limits overlap with past estimates (Table 13). The dramatic population drop observed at the Buskin River weir in 1991 does not appear to have resulted in a noticeable reduction in the 1993 American River spawning population.

The point estimate of 8,454 spawning Dolly Varden in the Olds River in 1993 is by far the highest ever recorded, although its 95% confidence limits overlap with past estimates (Table 13). We did not detect a drop in the Olds River spawning population linked to the low 1991 weir count.

In summary, the dramatic decrease in the size of the overwintering population in Buskin Lake, that was observed at the weir in the spring of 1991 did not result in a reduction in the number of spawning fish in the Olds and American rivers in 1993. The overwintering population is very large (ranging from 30,000 to 90,000 fish) in comparison to the number of spawners in the Olds and American rivers (few than 15,000 fish). The Buskin River and Lake population can fluctuate dramatically from year to year, but not suffer a decline in stock reproductive potential as long as the abundance of spawning fish is not reduced. Sport harvest of Dolly Varden from the Buskin River, which now averages less than 5,000 fish annually, is not significant in comparison to the fluctuations we have observed, and is not likely to affect the population size. However, sport harvest of the spawning populations should be monitored to assure that the spawning stock is not significantly reduced.

Table 13.-American and Olds rivers Dolly Varden population abundance estimates, 1988-1993.

American River				
			95% Confidence Interval	
Year	Abundance	SE	Lower limit	Upper limit
1988[a]	3,048	419	2,227	3,869
1989[b]	4,125	805	2,547	5,703
1990[c]	3,947	540	2,889	5,005
1991[d]	3,375	469	2,456	4,294
1993[e]	5,881	1,352	3,232	8,530

Olds River				
			95% Confidence Interval	
Year	Abundance	SE	Lower limit	Upper limit
1989[b]	3,856	545	2,789	4,925
1991[f]	2,669	197	2,456	4,294
1993	8,454	2,715	3,132	13,775

[a] S. Sonnichsen, Alaska Department of Fish and Game, Anchorage, personal communication.

[b] Sonnichsen 1990.

[c] Whalen 1991.

[d] Whalen 1992.

[e] The length distribution shifted between events in 1993, indicating that this estimate may be biased.

[f] Whalen 1992. This estimate is biased due to unequal capture probabilities between sublocations and among size groups.

Recommended Research and Management Activities

The last population abundance research was conducted in the spring of 1992 and fall of 1993. The large emigration count of 74,451 Dolly Varden from Buskin Lake, and the large spawning population estimates on the American and Olds rivers in the fall of 1993, both indicated that the Dolly Varden population was above average in abundance when compared to other years. Since continued population monitoring is not scheduled, sport catches will be used as an indicator of population abundance.

It is important to focus on catches and not harvests when using the sport fishery as an indicator of population size. Since 1992 there has been a trend for anglers to release Dolly Varden, and road zone harvests averaged only 4,410 fish from 1992-1997, only about 44% of the 1988-1992 average (Table 10). But catches have remained high, averaging about 21,810 fish. Anglers are choosing to release a higher percentage of their catch.

A problem associated with using the sport fish catch as a tool to gauge Dolly Varden population size is that an unknown portion of the Dolly Varden catch is made incidentally while anglers are fishing for sockeye, pink and coho salmon. The total Dolly Varden catch is influenced by the amount of fishing effort that occurs during these salmon fisheries, which may vary from year to year based on weather conditions and run strength. Therefore, the Dolly Varden catch from year to year may reflect changes in effort in other fisheries, rather than changes in the Dolly Varden population.

Keeping these limitations in mind, sport fish catches will be used as a general indicator of Dolly Varden population abundance. If Dolly Varden catches drop far below average, spawning population abundance estimates can be made on the American and Olds rivers to determine if the population has declined and if fisheries restrictions should be implemented.

KODIAK ROAD ZONE PINK SALMON FISHERY

Historical Perspective

Pink salmon return to Kodiak road zone streams from mid-July through early September. Peak immigration typically occurs during the second week of August. In the Buskin River, 50% of the return has usually passed the weir by the second week of August (Appendix G2). Spawning occurs in stream reaches both upstream and downstream of road system bridges beginning in August. The returns of pink salmon in odd-numbered years are higher than on even-numbered years.

The intertidal reach of the Buskin River, considered to be the area downstream of Bridge No. 1, is open to the taking of salmon all year long. The remaining streams along the Kodiak road zone that flow into Monashka and Chiniak bays are open to salmon fishing year-round in the reaches downstream of the highway bridges. Waters upstream of Bridge No. 1 on the Buskin River and upstream of the highway bridges on remaining streams are closed to salmon fishing from August 1 through September 15. The bag and possession limits for salmon over 20 inches in length are 5, no more than 2 of which may be sockeye or coho salmon.

From 1988 through 1997, the waters of the Kodiak road zone accounted for an average harvest of 8,510 pink salmon. This represents an average of 57% of the total KMA pink salmon harvest over this period (Table 14). About 62% of the road zone pink salmon harvest occurs in freshwater systems, with 38% occurring in salt water. Pink salmon returning to streams along the Kodiak road zone are also harvested in commercial and subsistence fisheries (Appendices C and D). Commercial harvests are larger than sport harvests whereas subsistence harvests are significantly smaller than sport harvests.

Major sport fisheries for pink salmon in the Kodiak road zone occur on the Buskin, Pasagshak, American, and Olds rivers. Since 1977, these four river systems have accounted for an average harvest of 4,510 pink salmon, or 53% of the total Kodiak road zone pink salmon harvest (Table 15). Of these systems, the Buskin River has supported the largest fishery for pink salmon. Since

1988, the average harvest of pink salmon from the Buskin River has been 2,290 fish (Table 15). Other significant fisheries for pink salmon in the Kodiak road zone occur along the shorelines and marine waters of Chiniak and Ugak bays.

Recent Fishery Performance

The pink salmon runs along the Kodiak road zone were generally weak from 1990-1992. Commercial harvest of pinks in Monashka and Chiniak bays averaged 275,000 from 1980 to 1988 but decreased to approximately 121,000 from 1990-1992 (Appendix C4). The sport fish harvest also decreased in the early 1990s. The 1985-1989 average pink salmon sport fish harvest along the Kodiak road zone was 12,800 but dropped to 7,100 in 1990-1992 (Table 14, Figure 8). The 1993 and 1995 road zone harvests of 10,770 and 9,310 pink salmon were more in keeping with past harvests.

Table 14.-Harvest of pink salmon from Kodiak road zone waters of the Kodiak Management Area, 1988-1997.

	Kodiak Road Zone Harvest				KMA	
Year	Freshwater	Saltwater	Total	% of KMA	Harvest	Release
1985	6,455	2,930	9,385	61	15,426	
1986	8,594	3,699	12,293	71	17,365	
1987	6,157	4,710	10,867	80	13,532	
1988	8,968	7,638	16,606	53	31,296	
1989	9,820	5,269	15,089	52	29,176	
1990	4,841	1,695	6,536	22	29,997	35,533
1991	5,930	4,313	10,243	85	12,106	22,166
1992	3,031	1,345	4,376	38	11,473	29,454
1993	6,159	4,610	10,769	69	15,570	47,822
1994	2,979	1,261	4,240	70	6,032	20,559
1995	5,532	3,776	9,308	71	13,185	36,050
1996	3,053	1,051	4,104	55	7,466	29,817
1997	2,894	975	3,869	56	6,919	39,894
1988-1997 Average	5,321	3,193	8,514	57	16,322	32,662

Note: The Kodiak road zone totals were calculated by adding numbers from the SWHS listed for the Buskin, American, Olds, Pasagshak, and Saltery rivers; roadside lakes; Chiniak Bay and shore; Mill Bay Beach; other roadside streams; and also any other fresh waters in the Kodiak road zone that are identified from unpublished SWHS site estimates.

Table 15.-Harvest of pink salmon from selected Kodiak road zone streams, 1977-1997.

	Buskin River		Pasagshak River		American River		Olds River		Total	
Year	Harvest	Release	Harvest	Release	Harvest	Release	Harvest	Release	Harvest	Release
1977	3,868		1,423						5,291	
1978	4,752		1,006						5,758	
1979	4,036		1,173						5,209	
1980	6,122		1,731						7,853	
1981	3,856		713						4,569	
1982	7,357		94						7,451	
1983	4,196		178		430		199		5,003	
1984	4,701		499		835		611		6,646	
1985	3,812		501		380		440		5,133	
1986	5,810		321		948		1,086		8,165	
1987	2,354		706		1,739		1,105		5,904	
1988	5,202		327		1,310		982		7,821	
1989	4,402		804		1,397		2,325		8,928	
1990	2,841	4,705	183	487	1,000	2,742	488	1,938	4,512	9,872
1991	1,942	2,430	601	1,124	1,472	3,170	1,246	1,916	5,261	8,640
1992	1,557	3,710	403	559	513	2,070	476	2,409	2,949	8,748
1993	1,104	5,276	381	927	560	6,400	2,676	7,712	4,721	20,315
1994	751	3,102	81	398	314	2,166	694	3,926	1,840	9,592
1995	2,367	4,621	193	922	688	5,277	1,134	3,427	4,382	14,247
1996	1,726	4,460	86	889	271	2,491	338	1,449	2,421	9,289
1997	970	3,839	110	1,595	707	8,606	521	3,744	2,308	17,784
1988-1997 Average	2,286	4,018	317	863	823	4,115	1,088	3,315	4,514	12,311

During 1996 and 1997, anglers showed a trend to release more of the fish they catch. The 1996 and 1997 KMA harvests of 7,466 and 6,920 pink salmon, respectively, were the third and second lowest harvests on record. However, the 1997 release of 39,890 fish was the second highest on record (Table 14).

Recent Board of Fisheries Actions

During the December 1995 Alaska Board of Fisheries Meeting the Board adopted a staff proposal that extended the upriver salmon fishing closure from August 1 through September 10 to August 1 through September 15. This regulation became effective for the first time during the 1996 fishing season. Streams draining into Monashka and Chiniak bays were closed to salmon fishing upstream of the Chiniak Highway from August 1 through September 15; with the exception of the Buskin River which was closed upstream of Bridge #1 from August 1 to September 15.

The last Board action regarding pink salmon bag and possession limits in the road zone occurred in 1987, when daily bag and possession limits for salmon (other than chinook salmon) were reduced to 5 and 5 fish, respectively, for fish over 20 inches in length (of which not more than 2 may be coho salmon and 2 may be sockeye salmon). The limits had previously been 6 daily, only 2 of which could be coho salmon, and 12 in possession, only 4 of which could be coho salmon.

Management Objectives

Management objectives for this fishery are to provide angling opportunities at a level that can be supported by the resource. Even-year minimum escapement goals for pink salmon have been established for the major streams producing pink salmon along the road system (Buskin 60,000; American 30,000; Olds 30,000). During odd years, minimum goals are: Buskin 100,000, American, 30,000; and Olds River, 30,000. The sport fishery will be managed so that spawning escapements approximate minimum spawning escapement goals.

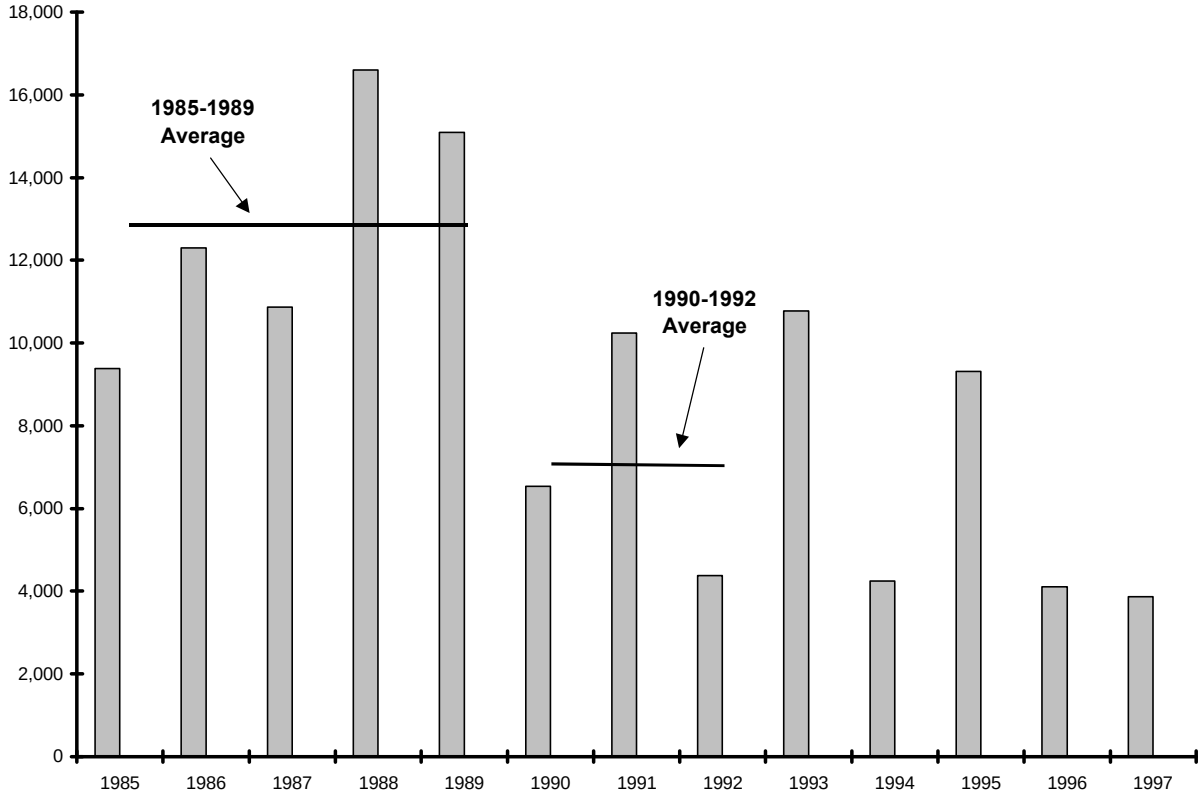

Figure 8.-Kodiak road zone pink salmon harvest, 1985-1997.

Current Issues

Pink salmon escapements to the Kodiak road zone commonly exceeded 500,000 fish during the 1980s (Appendix F1). During this same period, road zone sport fish harvests averaged about 12,000 fish, or about 2% of the total inriver returns (Table 14). Under these conditions, manipulating the sport fish harvest would do little to affect escapement goals. However, from 1990 to 1992 pink salmon returns along the road system were very weak, and foregoing a sport harvest would add to the spawning escapement and reproductive potential of the stocks. The exceptionally poor return in 1992 prompted restrictions in the sport fishery. The bag limit was reduced along the Kodiak road zone by emergency order to 2 fish per day and closed in the Buskin, American and Olds rivers. The large returns since 1993 reversed this trend for poor returns. No restrictions are expected in the near future for this fishery. Inseason monitoring of returns will continue and, if spawning escapements are significantly below minimum goals, then the sport fishery will be restricted.

Ongoing Research and Management Activities

No specific research or management activities are directed at this fishery. The weir on the Buskin River has not been operated during the majority of the pink salmon return since 1990 due to budgetary constraints. This will likely continue to be the case into the future. Aerial surveys have been used since 1991 to estimate the pink salmon escapement in area streams and should be continued (Appendix F1).

Outlook

The Division of Commercial Fisheries conducts a research project in order to forecast the return of pink salmon. The forecasted commercial harvest for 1999 is approximately 9.5 million fish which is about average for an odd year.

Inseason Management Approach

The magnitude of the pink salmon return to the Kodiak road zone will be judged using comparative commercial catch statistics and aerial survey data. If it appears that the return is significantly below average and minimum escapement goals will not be met, the sport fishery may be restricted.

If restrictions on the fishery are necessary to achieve minimum escapements, these restrictions should be initiated on or before August 10, the normal peak of the return. The options for restricting the fishery are numerous and include lowering the bag limit, closing specific waters, or decreasing fishing time. The option selected will be the one that disrupts or limits sport fishing opportunity the least but still adds a significant number of fish to the spawning escapement.

The sport fishery generally does not greatly influence the reproductive potential of stock, largely because of the large spawning escapements involved and the relatively small sport harvests. For example, sport harvests during odd years on the Buskin River have averaged approximately 2,160 fish since 1988. The minimum escapement goal for off years (1999) on the Buskin River is 100,000 fish. Even if spawning escapements were slightly below minimum, the sport removal of about 2,160 fish would not greatly impact the stock's ability to produce an abundant return. For this reason, the sport fishery will not be restricted unless it appears that spawning escapement will be significantly below the escapement goal.

Recommended Research and Management Activities

No additional research or management activities are recommended for this fishery at present. At this time, no changes in regulation are recommended with respect to this fishery.

KODIAK ROAD ZONE COHO SALMON FISHERY

Historical Perspective

Wild and stocked coho salmon return to Kodiak road zone streams from late August through October. Peak immigration typically occurs during mid-September. Spawning begins in late October.

Since 1984, anadromous coho salmon fingerlings have been stocked into seven different Kodiak road zone drainages. Returns from these stocking efforts have established major sport fisheries in several locations along the Kodiak road zone. The largest fisheries occur at Mill Bay and Mission Bay beaches. Fisheries for stocked returns also occur at Mayflower Beach. Stocking was discontinued at Kalsin Pond in 1994, and the last return from these stockings occurred in 1997.

The intertidal reach of the Buskin River, considered to be the area downstream of Bridge No. 1, is open to the taking of salmon year-round. The Buskin River upstream of Bridge No. 1 is closed to fishing for all salmon from August 1 through September 15. The remaining streams along the Kodiak road zone which flow into Monashka and Chiniak bays are open to salmon fishing year-round in the reaches downstream of the highway bridges, and closed from August 1 through September 15 in reaches upstream of the highway bridges. The bag and possession limits for salmon other than chinook are 5 salmon 20 inches or more in length, of which no more than 2 may be coho or sockeye salmon.

From 1988 through 1997, the average harvest of coho salmon from waters of the Kodiak road zone was 9,800 fish (Table 16), accounting for an average of 49% of the total KMA coho salmon harvest over this period. About 70% of the Kodiak road zone harvest has been from the Buskin, Pasagshak, Olds, and American rivers. Of these systems, the Buskin and Pasagshak rivers have supported the largest fisheries for coho salmon (Table 17). Since 1988, average harvests of coho salmon from the Buskin and Pasagshak rivers have been 2,990 and 1,710 fish, respectively (Table 17). Other significant fisheries for coho salmon in this area occur along the road zone shorelines near stream mouths.

Harvest that occurs from boats adjacent to the road system is not included in the road zone harvest presented in Table 16. Chiniak and Ugak bays waters within 1 mile of shore are controlled by road zone regulations. Waters outside of 1 mile are controlled by remote zone regulations. It is impossible to determine from the Statewide Harvest Survey if harvests reported from Chiniak Bay are within 1 mile of the shore or not.

In conjunction with the development of a saltwater troll fishery for chinook salmon, a coho salmon fishery is developing as well. The coho salmon harvest from Chiniak Bay in 1997 (5,050; Table 18) was far above the 1988-1996 average of 1,480.

Table 16.-Harvest of coho salmon from Kodiak road zone waters of the Kodiak Management Area, 1988-1998.

Year	Kodiak Management Area	Kodiak Regulatory Area	Kodiak Road System[a]	Afognak/Shuyak[b]
1988	21,379	18,809	14,006	3,802
1989	23,700	19,802	13,742	2,698
1990	20,065	13,728	8,210	3,096
1991	21,327	17,691	11,252	3,567
1992	16,920	13,668	7,091	3,101
1993	22,889	21,241	12,098	2,746
1994	14,600	12,406	7,118	2,346
1995	15,194	13,236	6,836	2,563
1996	19,773	16,822	7,253	3,734
1997	25,491	23,763	10,162	3,860
Average	20,134	17,117	9,777	3,151

Source: Mills 1989-1994, Howe et al. 1995-1998.

[a] The Kodiak road zone totals were calculated by adding numbers from the SWHS listed for the Buskin, American, Olds, Pasagshak, and Saltery rivers; roadside lakes; Chiniak Bay and shore; Mill Bay Beach; other roadside streams; and also any other fresh waters in the Kodiak road zone that are identified from unpublished SWHS site estimates.

[b] 1988-1997 includes published SWHS estimates for saltwater Afognak Island area, boat and shore; boat Shuyak; and Afognak Lagoon shore, along with individual responses that gave locations that are on Afognak Island or Shuyak but were lumped together with sites in the Boat other, Shoreline other, other remote streams or other remote lakes categories in the published SWHS report.

Table 17.-Harvest of coho salmon from selected Kodiak road zone streams, 1977-1997.

Year	Buskin River	Pasagshak River	American River	Olds River	Total
1977	890	1,169			2,059
1978	1,018	1,043			2,061
1979	2,870	2,409			5,279
1980	2,643	2,480			5,123
1981	2,269	1,015			3,284
1982	2,431	1,100			3,531
1983	2,307	1,322	378	31	4,038
1984	1,871	1,646	486	561	6,140
1985	2,937	2,292	349	562	6,142
1986	4,251	2,951	826	1,651	9,679
1987	3,133	3,477	435	235	7,280
1988	3,474	2,637	1,710	1,273	9,094
1989	4,984	2,100	1,500	2,571	11,155
1990	1,521	2,105	849	948	5,423
1991	4,121	1,296	794	1,778	7,917
1992	1,474	1,733	583	1,085	4,875
1993	4,125	2,073	2,340	1,838	10,376
1994	2,429	973	642	1,082	5,126
1995	2,132	1,187	794	833	4,946
1996	2,618	1,499	745	869	5,371
1997	2,983	1,506	1,928	1,657	8,047
Average 1988-97	2,986	1,711	1,189	1,393	7,233
Average 1977-97	2,690	1,810	957	1,132	6,045

Source: Mills 1979-1994 and Howe et al. 1995-1998.

Table 18.-Marine boat harvest of coho salmon from Chiniak Bay, Ugak Bay, Afognak, Shuyak Islands, and all Kodiak Regulatory Area waters from 1988-1997.

	Kodiak Road Zone			Total Kodiak
	Chiniak Bay Boat	Ugak Boat	Afognak/Shuyak Boat	Regulatory Area Boat
1988	1,364	0	2,310	3,783
1989	934	0	1,783	3,088
1990	915	0	2,028	7,083
1991	1,056	0	2,195	3,401
1992	996	0	1,207	2,921
1993	2,093	19	1,680	5,006
1994	1,533	0	1,557	3,380
1995	2,281	28	945	2,543
1996	2,174	20	1,837	6,831
1997	5,054	241	2,695	9,956
Average	1,840	31	1,824	4,799

Source: Mills 1989-1994, Howe et al. 1995-1998, and unpublished data from individual responses to the Statewide Harvest Survey (SWHS).

Recent Fishery Performance

By regulation, salmon fishing in streams flowing into Monashka and Chiniak bays is confined to waters below the road zone bridges, and below Bridge #1 on the Buskin River, from August 1 through September 15. During the 1998 season, there was concern for the escapement in the American River because of poor escapements in 1995 and 1996, when only 169 and 70 fish were counted, respectively. Because of this concern the American River was surveyed on September 8, 13, and 14; resulting in counts of 14, 33, and 80 coho salmon, respectively. Coho salmon returns can often be late, but a survey on the Olds River on September 8 produced a count of 1,033 coho salmon, and the Buskin weir had counted 3,700 on this date, indicating that the returns in Chiniak Bay were not late.

As a result, the upriver section of rivers were open to sport fishing for salmon on September 16, as scheduled by regulation, with the exception on the American River. The entire American River was closed to sport fishing for salmon on September 16. Additional surveys were conducted on the American River on October 2 and 8, resulting in counts of 621 and 534 coho salmon, respectively. Because escapement had improved and was above the 300-400 escapement range, the American River was opened to salmon fishing on October 8.

With the exception of the delayed opening date for the American River in 1998, sport fishing for coho salmon has been excellent along the Kodiak road zone. Counts from the Buskin, American, Olds, and Pasagshak rivers in 1997 and 1998 were generally above the 1987-1996 average (Table 19). These data show that the coho salmon return to the Kodiak road zone during the past 2 years was very strong.

In addition to the freshwater fishery, boat harvest from salt water adjacent to the road system has increased during the past 2 years. As mentioned in the section on historical perspective above, the boat harvest in Chiniak Bay of 5,050 coho salmon in 1997 was a record. The 1998 harvest is expected to be as large or larger than the 1997 harvest. During the coded wire tag recovery program for chinook salmon, department personnel observed 970 coho while sampling 313 chinook salmon. Increased harvest is probably due to an increase in effort targeting salmon in salt water as well as an increased abundance of fish. The increased abundance of coho salmon in Chiniak Bay during the past 3 years coincides with increased hatchery production from Kitoi Bay, which is located less than 25 miles from Chiniak Bay.

Table 19.-Buskin River weir counts, and peak foot surveys of coho salmon from selected Kodiak road zone streams, 1985-1998.

	Weir Counts	Foot Surveys		
	Buskin River	Pasagshak River	American River	Olds River
Escapement Goals	(5,300-8,300)	(1,500-3,000)	(300-400)	(450-675)
Year				
1985	9,474		439	1,648
1986	9,939	3,524	221	1,849
1987	11,103	2,519	555	842
1988	6,782			
1989	9,930			769
1990	6,222	2,178	419	1,706
1991	8,929			570
1992	6,535		181	320
1993	6,813	1,337	412	525
1994	8,146		194	395
1995	8,694		169	2,642
1996	8,439	1,973	69	2,200
1997	10,926	2,813	2,204	4,064
1998	9,062	1,917	1,360	2,296
Average (1987-96)	8,159	2,002	286	1,108
Average (1985-98)	8,642	2,323	566	1,525

Management Objectives

Management objectives for this fishery are to provide angling opportunities at a level that the fisheries resource can support. The fishery will be managed so that a minimum spawning escapement of 5,300 coho salmon will be achieved in the Buskin River. The fishery will also be managed so that other index coho salmon systems along the road (American River, Olds River, Salonie Creek, Roslyn Creek, and Pasagshak drainage) continue to receive sufficient spawning escapements.

Recent Board of Fisheries Actions

Until 1996, salmon fishing in waters above the highway for streams that drain into Chiniak and Monashka bays was closed from August 1-September 10 (and above Bridge #1 on the Buskin River). This regulation had been in effect for over 20 years. The original intent of the regulation was to protect spawning pink salmon. The lower rivers were left open to fishing, allowing angling opportunities for bright pink salmon and early-arriving coho salmon. As fishing pressure increased for coho salmon in recent years, this upriver closure has been used by fisheries managers to protect coho salmon as well as pink salmon. If it appeared that coho salmon were abundant and escapement goals would be achieved, these upriver areas were opened to fishing as scheduled on September 11. If the return appeared weak or could not be evaluated, the upriver fishing closures were extended so that harvests were reduced and spawning objectives met.

The main problem that developed was that the Buskin River weir was used to regulate the fishing season for all the streams that drain into Chiniak and Monashka bays. The Buskin River return may not be indicative of the run strength in other nearby streams. Also, by September 10 only about 30% of the return has occurred, making it difficult to assess run strength before the September 11 opening. In addition, several of the local index streams showed below-average year-end coho salmon escapements in 1991 through 1995.

The season opening date above the highway had been delayed in 5 of the past 10 years. This created an unorderly fishery for the public and enforcement officials. Using the Buskin River weir to regulate the open season for all streams had lead to a situation where escapement goals were achieved on the Buskin River but sometimes were not achieved in other index streams.

At the December 1995 Board of Fisheries meeting, the Department proposed a regulation change to improve management of this fishery. The upriver opening date was delayed until September 16. This proposal was expected to increase the orderliness of the fishery and result in achieving escapement objectives in all area streams. The Board accepted this proposal, and the new regulation became effective for the 1996 fishing season, extending the upriver salmon fishing closure from August 1-September 15.

This delay in opening date should help increase escapements into index streams. The public will be able to depend on this opening date since there is little inseason information to make adjustments on the opening date of these index streams. The September 16 upriver opening date on the Buskin River gives the department more time to evaluate run strength. If escapement objectives in the Buskin River can be assured at an earlier date, based on weir information, then the upriver section of the Buskin River can be opened earlier than September 16.

Current Issues

Based on informal angler interviews, it appears that the recreational fishery for coho salmon in the Kodiak road zone is the most important sport fishery in the Kodiak Management Area in terms of angler preference and participation. Since 1988 the Kodiak road zone coho salmon sport harvest has averaged 53% of the total coho salmon harvest in the entire KMA. The sport harvest on the road zone has averaged approximately 12,000 coho, with an increasing saltwater vessel harvest which exceeded 5,000 coho in 1997 (Table 18). The commercial fishery averaged approximately 6,500 coho salmon from 1986-1995, and the subsistence fishery 2,750 fish during the same time. Due to its proximity to the town of Kodiak and high angler interest, the sport fishery has the potential to overharvest the coho resource. Fishery Data Series No. 93-24 (Schwarz 1993) was written to document the history of road zone coho salmon stocks. In this report, harvest from all fisheries, run timing, escapement and stocking statistics for the years 1980-1990 were compiled. This report along with data in the annual management report can be used to evaluate stock status and effectiveness of management practices.

Ongoing Research and Management Activities

A weir on the Buskin River (Table 20) and foot or aerial surveys on other area streams are currently used to estimate escapement levels. Scale samples are taken from the Buskin River sport harvest, as well as during the coho egg take, so that brood tables can be developed and escapement goals refined.

During 1997 and 1998, research was conducted on the American and Olds rivers to evaluate if foot surveys are a valid way to monitor escapement (Begich and Schwarz *In prep*). Population estimates were made during both years using mark-and-recapture methods. In the American River in 1997, beach seines were used to mark and recapture 427 coho, generating a population estimate of 2,600 coho. The average foot survey counted 1,500 fish (Table 21). In 1998, 162 coho were tagged to generate a population estimate of 1,260 fish. The average October index survey counted 775 coho. Agreement between years was very good: 58% of the fish present were counted during foot surveys in 1997, and 62% were counted in 1998. Foot surveys were validated as a way to monitor escapements, as observers counted the same proportion of fish during a record return as an average return.

In the Olds River, 860 coho were marked and recaptured in 1997 to generate a population estimate of 5,900 fish. The average foot survey counted 3,750 coho. In 1998, 297 coho were tagged to generate a population estimate of 2,200 fish. The average 1998 foot survey counted 1,340 coho. Similar to the American River, survey agreement between years was good: 68% of the fish were counted in 1997, and 58% of the fish were counted in 1998.

Inseason Management Approach

As stated under the section on recent Board of Fisheries Actions, a new regulation became effective during the 1996 season. Streams flowing into Monashka and Chiniak bays are closed to salmon fishing from August 1 through September 15 upstream of the Chiniak Highway, and upstream of Bridge #1 on the Buskin River. Streams other than the Buskin River will open on September 16 unless there is some inseason information that indicates the escapement objectives will not be met.

Table 20.-Numbers of anadromous fish passed through the Buskin River weir, 1985-1998.

Year	Dolly Varden Emigration	Steelhead Kelts[a]	Sockeye Salmon	Pink Salmon	Dolly Varden Immigration	Coho Salmon	Chum Salmon	Chinook Salmon
Weir operated upstream of Bridge #1 from April through October								
1985	21,797	223	18,010	153,026 [b]	20,540	9,474	7	
1986	41,659	71	8,939	98,958 [b]	24,110	9,939 [f]	51	
1987	29,919	105	12,690	27,892 [b]	32,848	11,103 [f,g]	79	
1988	30,336	357	12,144	203,578 [b]	34,386	6,782 [f,g]	84	
1989	35,603	205	17,853	159,123 [b]	33,306	9,930 [g]	79	
Beginning in 1990, the weir has been located at the outlet of Buskin Lake during the sockeye immigration (June and July) and then moved to upstream of Bridge #1 during the coho immigration (Mid July through September). From 1990-1992 the weir at the lake outlet was also operated during the spring Dolly Varden emigration.								
1990	91,107 [c]	150 [d]	10,528 [h]	42,889 [b]	6,416 [e]	6,222	18	
From 1991 to the present, the weir is only operated during sockeye and coho emigration.								
1991	30,725 [c]	148 [d]	9,789 [h]	37,736 [i]	812 [i]	8,929	21	
1992	74,451 [c]	201 [d]	9,782 [h]	25,141 [i]	868 [i]	6,535	9	6
1993	140 [j]	13 [j]	9,526 [h]	53,484 [i]	4,960 [i]	6,813	22	8
1994	0 [j]	19 [j]	11,783 [h]	89,711 [i]	220 [i]	8,146	17	7
1995	0 [j]	15 [j]	15,520 [h]	72,826 [i]	5,401 [i]	8,694	43	8
1996	0 [j]	7 [j]	9,661 [h]	50,550 [i]	8,075 [i]	8,439	67	7
1997	0 [j]	14 [j]	9,840 [h]	47,396 [i]	1768 [i]	10,926	52	70
1998	0 [j]	26 [j]	14,767 [h]	134,403 [i]	17784 [i]	9,062	24	69

[a] Steelhead kelts are fish which have overwintered in the lake, spawned in the river during the spring, and are returning to the sea.

[b] Does not include an estimated 18,000, 12,000, 2,500, 30,000, 28,000, and 11,563 pink salmon spawning below the weir in 1985, 1986, 1987, 1988, 1989, and 1990, respectively.

[c] A small Vexar mesh was placed over the weir in order to obtain a complete count during 1990, 1991, and 1992. Prior to 1990 only fish greater than 300 mm were effectively counted.

[d] The weir was moved to Buskin Lake outlet. These steelhead were not kelts but pre-spawning ripe fish.

[e] A flood during peak immigration made it impossible to estimate migration. This figure is a partial count.

[f] A total of 350, 400, and 600 coho were estimated below the weir when it was removed in 1986, 1987, and 1988, respectively. These estimates were added to the weir counts.

[g] The 1987 return of coho was enhanced by the stocking of 40,000 fry in 1984, the 1988 return by the stocking of 44,000 fry in 1985, and the 1989 return by the stocking of 50,000 fry in 1986.

[h] Since 1990 the weir was moved upriver to the outlet of Buskin Lake. Sockeye entering the tributary lakes of Louise and Genevieve are not counted at the upriver location.

[i] The weir was not operated during late July and early August. Pink salmon counts have been supplemented by aerial surveys in order to estimate escapement. Dolly Varden immigration counts are incomplete and have not been expanded to estimate a total immigration.

[j] The weir was not operated in April and May. These counts are incomplete and have not been expanded to estimate total emigration.

Table 21.-Summary of foot survey counts and mark-recapture population estimates for spawning coho salmon at the American and Olds rivers, 1997 and 1998.

1997					
American River			Olds River		
Date	Count		Date	Count	
01-Oct	1,467		04-Oct	3,380	
09-Oct	940		10-Oct	3,779	
24-Oct	2,204		22-Oct	4,064	
31-Oct [a]	2,450				
Upper River					
Population estimate [b]	602		Population estimate [b]	5,872	
Lower 95% CI	505		Lower 95% CI	4,777	
Upper 95% CI	698		Upper 95% CI	6,968	
Lower River					
Population estimate [b]	2,001				
Lower 95% CI	784				
Upper 95% CI	3,219				
1998					
American River			Olds River		
Date	Count		Date	Count	
08-Sep	14		08-Sep	1,033	
13-Sep	33		02-Oct	2,296	
14-Sep	80		20-Oct	1,133	
02-Oct	507				
02-Oct	621				
08-Oct	534				
21-Oct	1,360				
27-Oct	832				
27-Oct	795				
Population estimate [b]	1,263		Population estimate [b]	2,199	
Lower 95% CI	933		Lower 95% CI	1,740	
Upper 95% CI	1,593		Upper 95% CI	2,658	

[a] Helicopter survey

[b] Mark-recapture population estimate.

The Buskin River weir will be used to monitor coho escapement into the Buskin River. The section of the Buskin River above Bridge #1 may be opened as early as September 11 by emergency order if it appears that the minimum escapement objective will be met. (In order to achieve a minimum of 5,300 spawning coho the weir count on September 7 must be about 1,700 fish). If the fishery is not opened on September 11 it will not be opened until minimum escapement objectives can be assured. A weir count of 2,400 is necessary by the end of counting on September 12, if the upriver waters are to be opened on September 16. If the upriver closure is not sufficient to ensure minimum escapements are achieved, then additional restrictions may be implemented (reduction in bag limits, additional area closures or time closures). The weir count by October 1 should be 6,000 to ensure that 5,300 spawning fish remain after the sport harvest.

Recommended Research and Management Activities

It is essential to maintain operation of the Buskin River weir in order to gauge run strength of Chiniak Bay coho salmon inseason. This management tool allows for conservation of the resource as well as providing maximum fishing opportunities to anglers.

In addition to the Buskin River there are many smaller streams which provide fishing opportunities on the Kodiak road zone: Monashka Creek, Pillar Creek, Sargent Creek, Russian Creek, Salonie Creek, American River, Olds River, Roslyn Creek, Chiniak Creek, Pasagshak drainage, Saltery Creek, and Miam Creek. The only way to evaluate the success of the existing management system is to monitor escapement levels in these streams annually. Although escapement surveys are conducted after all fisheries have taken place, they still provide the data necessary to observe trends. If decreasing trends are noted over 2 or 3 years then the management strategy can be adjusted to better provide for stock conservation. Without documenting escapement it is difficult to evaluate management strategies. We recommend that the above-mentioned streams be walked at least once to document spawning escapement. The six largest streams should be walked twice. Results of these surveys can be found in Appendix E.

The effectiveness of using foot surveys to monitor coho escapement into the Pasagshak drainage should be evaluated. Unlike the American and Olds rivers, the Pasagshak drainage includes a lake (Lake Rose Tead). Tributary streams are the only locations that are currently surveyed. It is possible that a varying percentage of the total return enters tributary streams from year to year, depending on environmental conditions. If this is the case, foot surveys of the tributary streams may not be an effective way to monitor coho returns into the Pasagshak drainage.

As fishing effort for coho salmon along the road zone continues to increase, the stocking program will increase in importance. This project provides additional fishing opportunities as well as relieving fishing pressure on the wild stocks. The 1994 statewide harvest survey (Howe et al. 1995) documented a harvest of 360 coho salmon, with 2,000 angler-days of effort at Mill Bay beach, a return location for stocked coho. Mission beach received 1,380 days of angler effort with a harvest of 220 coho. Starting in 1993, coho fingerlings were no longer provided by the Kitoi Bay hatchery. Afognak coho salmon were no longer used as a brood source, in favor of the Buskin River. The change in this program was initiated because of concerns that returning adults of Afognak origin would stray into local streams and genetically mix with wild stocks. Buskin returns are typically 2 to 3 weeks later than Afognak coho, so fishing opportunities in

mid to late August for stocked coho will be lost, due to the change in brood source. The Kodiak Regional Aquaculture Association is incubating Buskin coho salmon eggs free of charge at the Pillar Creek fish hatchery. Rearing space at the Pillar Creek hatchery is very limited and as a result coho fingerlings are stocked soon after they hatch. Released fish have averaged less than 0.5 grams per fish, significantly smaller than the Kitoi Bay hatchery fingerlings, which averaged over 1 gram per fish. Returns to Mill Bay and Mission beaches were diminished during 1997 and 1998, probably due to the small size of fingerlings at release. In 1997 the Statewide Harvest Survey did not receive any responses from people fishing at either Mill Bay or Mission beaches, indicating a significant drop from what was reported in 1994. Sport Fish Division should work with the aquaculture association to see if additional rearing space for coho fingerlings can be provided.

KODIAK ROAD ZONE SOCKEYE SALMON FISHERY

Historical Perspective

Three sockeye salmon populations are present on the Kodiak road zone: the Buskin River, Pasagshak drainage, and Saltery River populations. Sockeye salmon return to Kodiak road zone lakes from June through August with peak immigration varying by stream. The Saltery River supports the latest returning sockeye salmon run on the road zone. Because of the limited access into Saltery Cove (4-wheel drive or float plane), the Buskin River and Pasagshak drainage receive most of the fishing effort. Spawning occurs in mid August.

The intertidal reach of the Buskin River, considered to be the area downstream of Bridge No. 1, is open to the taking of salmon year-round. The remaining streams along the Kodiak road zone which flow into Monashka and Chiniak bays are open to salmon fishing year-round in the reaches downstream of the highway bridges, waters upstream of Bridge No. 1 on the Buskin River and upstream of the highway bridges on remaining streams are closed to salmon fishing from August 1 through September 15. The bag and possession limits for salmon other than chinook are 5 salmon 20 inches or more in length, of which no more than 2 may be sockeye or coho salmon.

From 1988 through 1997, the average harvest of sockeye salmon from waters of the Kodiak road zone was 3,820, accounting for an average of 41% of the total KMA sockeye salmon harvest over this period (Table 22). About 84% of the road zone harvest has been from the Buskin, Pasagshak, and Saltery rivers (Table 23). From 1988 through 1997, the average harvests of sockeye salmon from the Buskin, Pasagshak, and Saltery rivers were 1,840, 830, and 710 sockeye, respectively (Table 23).

Recent Fishery Performance

The sport harvest of sockeye salmon from Kodiak road zone waters during 1997 (4,260) was slightly higher than the average harvest of 3,820 (Table 22). The Buskin River had the largest harvest with 2,030 sockeye, followed by the Pasagshak and Saltery with 1,050 and 770 fish, respectively. Escapement goals were achieved in each lake. Escapement counts are presented in Appendix F2.

During 1998, sockeye salmon returns were above average in the Buskin (weir count of 14,770 sockeye), below average in Pasagshak (aerial survey index count of 1,850), and slightly below average in Saltery (weir count of 26,260) (Appendix F). Although escapement goals were achieved in all systems, the Pasagshak return was weak. Harvest and catch estimates are not yet

available for 1998, however they are expected to be similar to 1997. Over the past 10 years sockeye salmon harvest on the road zone has been fairly stable (Figure 9).

Management Objectives

Management objectives for this fishery are to provide angling opportunities at a level that can be supported by the resource. The Buskin River fishery will be managed so that a minimum spawning escapement of 8,000 fish is achieved in Buskin Lake. The minimum spawning escapement objective in Saltery is 20,000 sockeye. Escapement trends will be monitored in Pasagshak through aerial surveys, to ensure that at least average escapement into this lake is occurring. Aerial survey counts in the Pasagshak have varied considerably since 1980 but have averaged 9,090 fish (Appendix F2).

Table 22.-Harvest of sockeye salmon from Kodiak road zone waters of the Kodiak Management Area, 1988-1997.

	Kodiak Road Zone		
Year	Harvest	% of KMA	KMA Harvest
1988	4,166	47	8,853
1989	4,004	30	13,173
1990	2,901	35	8,224
1991	2,814	56	5,049
1992	3,140	37	8,408
1993	3,685	47	7,849
1994	5,418	40	13,502
1995	2,918	31	9,333
1996	4,938	42	11,727
1997	4,256	47	9,097
Average	3,824	41	9,522

Note: The Kodiak road zone totals were calculated by adding numbers from the SWHS listed for the Buskin, American, Olds, Pasagshak, and Saltery rivers; roadside lakes; Chiniak Bay and shore; Mill Bay Beach; other roadside streams; and also any other fresh waters in the Kodiak road zone that are identified from unpublished SWHS site estimates.

Table 23.-Harvest of sockeye salmon from selected Kodiak road zone streams, 1977-1997.

Year	Buskin River	Pasagshak River	Saltery Cove Streams	Total	% of Road System
1977	228	176		404	
1978	493	85		578	
1979	424	236		660	
1980	388	284		672	
1981	173	205		378	
1982	304	199		503	
1983	1,233	192		1,425	
1984	1,179	374		1,571	
1985	3,484	182		3,666	96
1986	2,339	428		2,767	81
1987	1,503	417		1,920	74
1988	2,274	819		3,093	74
1989	1,816	1,244	390	3,450	86
1990	998	1,018	417	2,433	84
1991	1,575	815		2,390	85
1992	1,981	427	518	2,926	93
1993	1,544	543	563	2,650	72
1994	2,573	861	1,237	4,671	86
1995	1,087	571	652	2,310	79
1996	2,545	958	1,128	4,631	94
1997	2,026	1,053	769	3,848	90
Average (1988	1,842	831	709	3,240	84

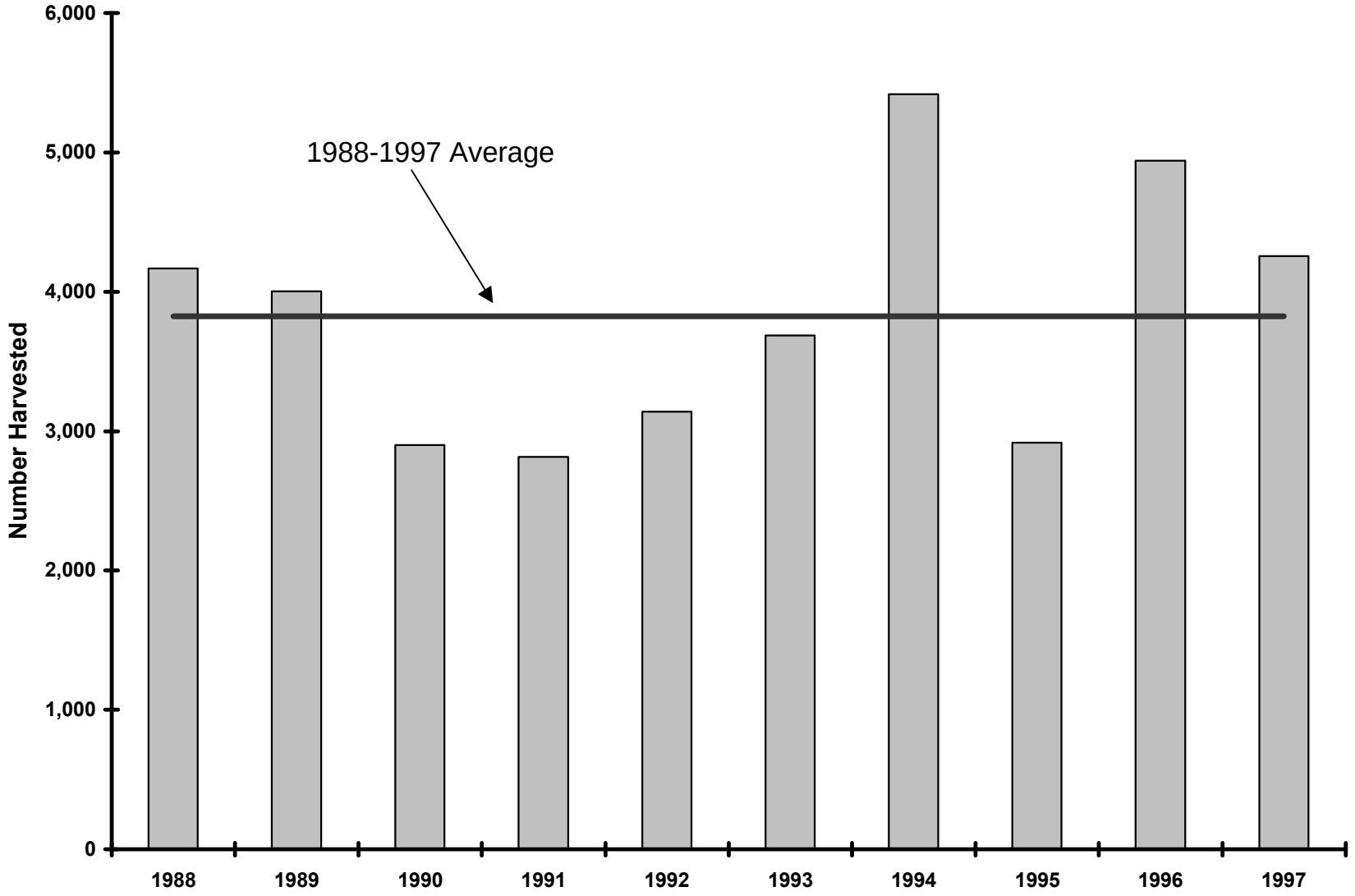

Figure 9.-Sport harvest of sockeye salmon from Kodiak road zone waters, 1988-1997.

Recent Board of Fisheries Actions

At the December 1995 Board of Fisheries meeting in Kodiak, the Board accepted a public proposal to increase the daily bag limit at Saltery Cove to 5 sockeye salmon. The previous bag limit for salmon other than chinook was 5, only 2 of which could be coho or 2 of which could be sockeye. The Board concluded that raising the bag limit from 2 sockeye to 5 sockeye would not jeopardize stock conservation or change the character of the fishery. The Board reached this conclusion because the escapement had been twice the minimum escapement goal of 20,000 every year for the past 5 years, and that sport catch and effort was relatively low due to restricted access. The possession limit was not changed, and remains one daily bag limit (5 salmon over 20 inches).

Current Issues

Due to its proximity to the town of Kodiak, the Buskin River sockeye salmon resource receives considerable sport and subsistence fishing pressure. The subsistence fishery is the major user with harvests averaging 4,390 sockeye salmon over the past 10 years (1988–1997, Appendix D). Over this same period, the average sport harvest of sockeye salmon from the Buskin River (1,840 fish) has been less than half of the subsistence harvest. There is no directed commercial fishery on the Buskin River sockeye salmon stocks. The average annual commercial harvest in Womens Bay during nondirected commercial fisheries from 1980-1998 has been less than 100 sockeye (Appendix C). Since 1985, the average escapement of sockeye salmon to the Buskin River weir has been 12,200 (Table 20). Current exploitation rates appear to be sustainable.

Due to budget cuts within Sport Fish Division, projects were prioritized and the Buskin River sockeye weir project was cancelled. Projects were cut statewide, and the sockeye weir was the only project cut in the Kodiak Management area. No inseason emergency order affecting the Buskin River sockeye fishery occurred over the 14 years that the weir operated. The current regulatory package in place for the Buskin River effectively assures that the sport fishery does not jeopardize achievement of escapement goals. In addition, the majority of the harvest does not occur in the sport fishery, which brought into question the appropriateness of expending Sport Fish Division funds to monitor the escapement.

Ongoing Research and Management Activities

A weir was operated on the Buskin River to count immigrating sockeye salmon from 1985-1998. Scale samples were collected from the escapement as well as from the subsistence harvest so that brood year tables could be constructed and escapement goals evaluated. Currently subsistence harvests are tabulated from returned permits. Sport harvests are obtained through the Statewide Harvest Survey. As mentioned in the section on current issues, the Sport Fish Division will not operate a weir in the Buskin to enumerate sockeye salmon. The Commercial Fisheries Division is considering operating the weir, if funding is available. The Sport Fish Division will assist with as much logistical support as possible (providing the use of portable office, skiff, and weir parts). Harvest information will continue to be collected via the Statewide Harvest Survey. The collection of scale (age) data is dependent on whether the Commercial Fisheries Division will be able to operate the weir and collect scales from the escapement and subsistence harvest. If escapement enumeration and age data are not collected, it will not be possible to complete brood year tables and evaluate the effectiveness of current escapement goals.

Inseason Management Approach

Since 1985, sockeye salmon have been enumerated through a weir on the Buskin River and time-of-entry data are available for this period (Appendix G1). A biological minimum escapement goal for the Buskin River of 8,000 sockeye is currently under review for formal adoption and, in the interim, is being used to manage the fishery. If inseason weir counts are available, and drop to a point where a minimum escapement of 8,000 sockeye cannot be assured, then the sport fishery will be restricted. Restrictions could consist of reducing the bag limit or closing specific areas or times, depending on how much the sport harvest needs to be reduced to achieve the minimum spawning objective. Inseason restrictions have not been necessary in the Buskin River.

If a weir is not operated, aerial surveys will be used to monitor trends in escapement. If a trend for decreased returns in noted, proposals to develop a more restrictive regulatory package for the Buskin River sport sockeye fishery will be considered.

Recommended Research and Management Activities

If a weir is operated by the Commercial Fisheries Division in 1999, we recommend that scale sampling of the spawning escapement and the subsistence harvest be conducted so that brood table development can continue. This sampling should occur even if the sampling rate is reduced and previous sampling goals can not be completely achieved.

KODIAK ROAD ZONE LANDLOCKED LAKES STOCKED FISHERIES

Historical Perspective

Stocking is currently being used to increase and diversify the opportunities for sport anglers fishing Kodiak road zone landlocked lakes. Several species of fish at various life stages have been stocked including rainbow trout fingerlings, Arctic grayling fry, and coho salmon fingerling. Rainbow trout have been stocked annually since the early 1950s. Arctic grayling stocking was terminated in 1995 because survival was very poor and anglers were not having success catching adult fish. Coho salmon are currently stocked in two landlocked lakes.

Regulations governing the stocked lakes vary by species. Within the Kodiak road zone, with the exception of the Saltery and Buskin Lake drainages, populations of rainbow trout are limited to hatchery-produced fish planted into landlocked lakes. The bag and possession limits for rainbow trout are 10 fish, only 1 of which may be 20 inches or more in length. Bag and possession limits for coho salmon under 20 inches in length are 10 per day, 10 in possession.

From 1988 through 1997, an average of 1,600 angler-days has been expended by recreational anglers fishing landlocked lakes along the Kodiak road zone (Table 24). This effort has represented about 1% (Table 24) of the total sport fishing effort expended by recreational anglers fishing KMA waters over this period. The average annual harvest of rainbow trout from stocked lakes from 1988 through 1997 was 475 fish (Table 24). The effort that occurs in the two lakes stocked with landlocked coho is so small that estimates made through the Statewide Harvest Survey are not possible. Road zone harvests have represented about half of the total KMA harvests of rainbow trout (Table 24).

In 1998, approximately 56,050 rainbow fingerlings were stocked along the Kodiak road zone (Table 9). A total of 11,000 coho fry were stocked in two landlocked lakes in 1997 on the Kodiak road zone, Pony Lake (also called Sawmill Lake) and Southern Lake on Long Island. No

coho were stocked in 1998. Stocking coho in landlocked lakes usually occurs every other year. Factors that determine frequency of stocking include: availability of fish, weather conditions which affect travel to Southern Lake, and the small size of the lakes which can produce small, stunted fish if too many fish are stocked.

MANAGEMENT OBJECTIVES

The management objectives for this fishery are to provide angling opportunities and diversity through a landlocked lake stocking project.

RECENT BOARD OF FISHERIES ACTIONS

The Board of Fisheries has taken no specific actions with respect to this fishery in recent years. At the December 1995 meeting in Kodiak the Board rejected a public proposal that would have allowed six poles to be fished through the ice in the road zone. The Board rejected this proposal because they did not think allowing six poles to be fished was in keeping with the character of a sport fishery. Currently two poles are allowed to be fished through the ice by each angler.

CURRENT ISSUES

Effort directed towards these stocked fish and harvest of the stocked fish has remained relatively low (Table 24). The cost of these projects is also relatively low, averaging less than $4,000 per year for all species combined. There are no major management issues regarding this fishery at present.

Table 24.-Number of angler-days of sport fishing effort and number of rainbow trout harvested by anglers fishing roadside lakes along Kodiak road zone, 1988-1997.

	Effort (Angler-Days)			Rainbow Trout Harvest		
Year	Lakes	KMA	% of KMA	Lakes	KMA	% of KMA
1988	1,646	91,631	2	490	964	51
1989	969	110,868	1	787	1,861	42
1990	1,475	116,197	1	812	1,528	53
1991	1,541	139,478	1	472	1,296	36
1992	2,261	108,700	2	901	1,179	75
1993	1,186	114,286	1	98	483	20
1994	1,277	116,413	1	470	731	64
1995	1,203	99,181	1	151	321	47
1996	3,384	120,204	3	334	465	72
1997	996	113,381	1	231	498	46
Average	1,594	113,034	1	475	933	51

ONGOING RESEARCH AND MANAGEMENT ACTIVITIES

Several lakes currently stocked are located on private property. An agreement to grant public access should be obtained if these lakes continue to be stocked.

The grayling catch and harvest has remained very low from the four lakes which were stocked. Because a fishery failed to develop for grayling, stocking was terminated in 1995, and the program was discontinued.

RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Greater education of the sport fishing public is recommended to increase use of these stocked fish. A map of stocked lakes with pictures of successful anglers fishing through the ice and in open waters should be developed and displayed at the Kodiak Fish and Game office to help make anglers aware of fishing opportunities in stocked lakes.

AFOGNAK/SHUYAK ISLAND FISHERIES

The Afognak/Shuyak Island group lies northeast of Kodiak Island. For purposes of this discussion, the group includes the fresh and nearby salt waters surrounding Afognak, Shuyak, Raspberry, Whale, and Marmot islands (Figure 10).

The marine and fresh waters of the Afognak/Shuyak Island group support the third most popular fishery in the KMA in terms of recreational angling effort expended from 1988-1997 (Figure 3). Since 1988, these waters have accounted for approximately 10% of the recreational angling effort expended in the KMA. There are two major fisheries that occur in the waters of the Afognak/Shuyak Island group. These fisheries target coho salmon and halibut. The halibut fishery is discussed in the North Kodiak Island Archipelago marine bottomfish section of this report.

AFOGNAK/SHUYAK ISLAND COHO SALMON FISHERIES

Historical Perspective

Coho salmon return to Afognak/Shuyak Island waters from mid August through mid October. Peak immigration typically occurs during early September with spawning beginning in October. From 1988 through 1997, the waters of the Afognak/Shuyak Island area accounted for an average harvest of 3,180 coho salmon, which represents an average of 16% of the total KMA coho salmon harvest over this period (Table 25). Nearly all of the harvest has occurred in salt water, with the majority occurring in the marine waters off Afognak Island. In the remote waters of the Kodiak Regulatory Area (including the Afognak/Shuyak Island group), the daily bag and possession limits for salmon (other than chinook) greater than 20 inches are currently 5 per day 10 in possession. For fish under 20 inches the limits are 10 per day 10 in possession.

A creel survey of selected coho salmon fisheries on Afognak and Shuyak islands was conducted during 1987 (Murray 1988b). Results of this survey conducted at five sites (Table 26) showed that anglers fished an estimated 3,520 angler-days to harvest an estimated 1,320 coho salmon. In 1987 the Afognak Lagoon coho fishery, which is the largest fishery on Afognak, was not surveyed so the harvest estimate for the surveyed sites cannot be compared to the Statewide Harvest Survey (SWHS) for the entire Afognak/Shuyak area. In 1990 a creel survey was conducted in Afognak Bay and Lagoon (Schwarz and Sonnichsen 1991). The creel survey

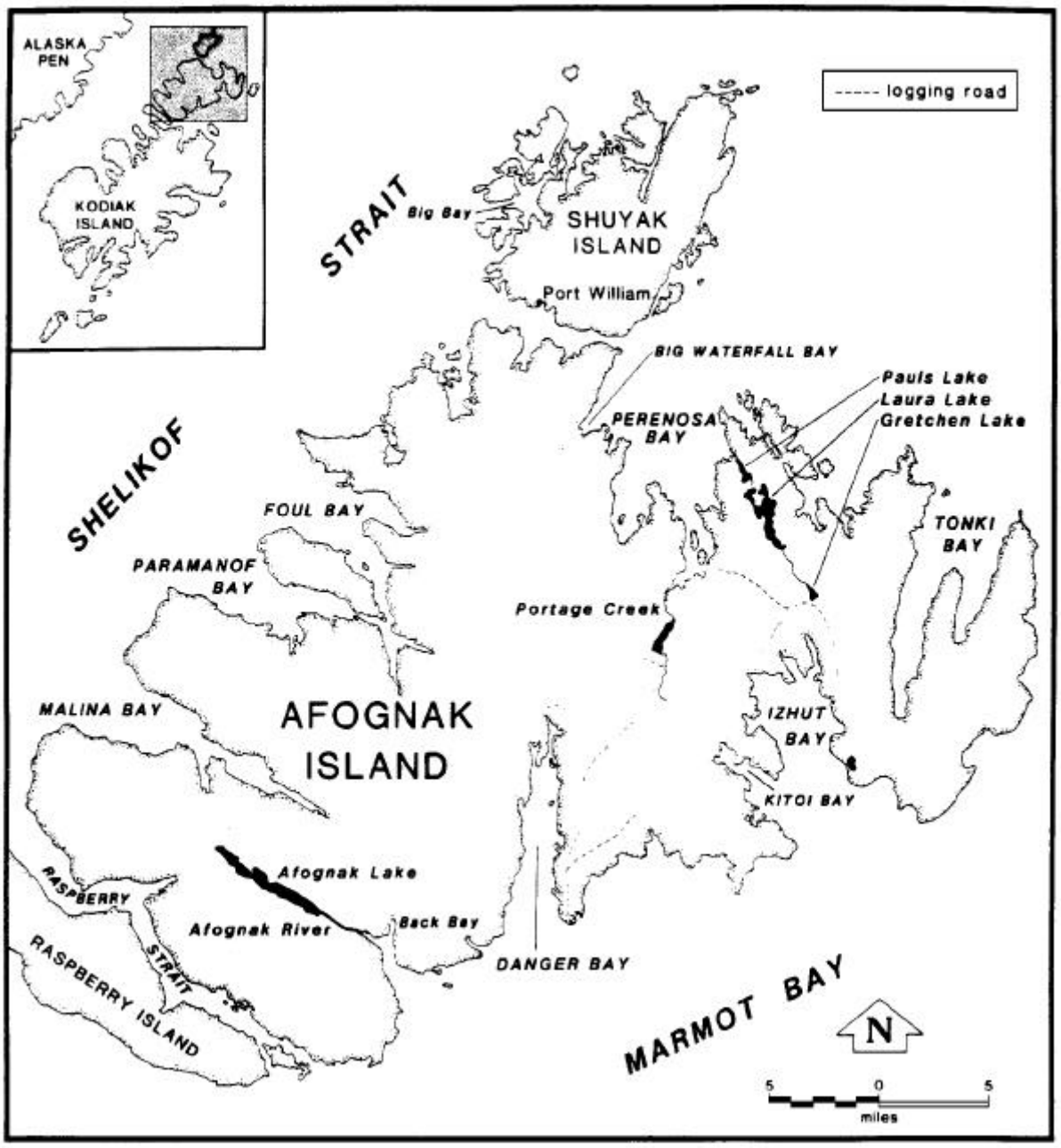

Figure 10.-Afognak/Shuyak islands and surrounding waters.

Table 25.-Sport harvest of coho salmon from Afognak/Shuyak islands waters of the Kodiak Management Area, 1988-1997.

Year	Kodiak Management Area Harvest	Afognak/Shuyak Islands Harvest[a]	Afognak/Shuyak Islands % of KMA
1988	21,377	3,860	18
1989	23,700	2,698	11
1990	20,065	3,096	15
1991	21,327	3,567	17
1992	16,920	3,101	18
1993	22,889	2,746	12
1994	14,600	2,346	16
1995	15,194	2,563	17
1996	19,773	3,734	19
1997	25,491	4,059	16
Average 1988-96	19,538	3,079	16
Average 1988-97	20,134	3,177	16

Source: Mills 1989-1994, Howe et al. (1995-1998), and unpublished data from individual responses to the Statewide Harvest Survey (SWHS).

[a] Includes SWHS estimates for saltwater boats Afognak Island area, shoreline Afognak Island area, Shuyak Boat, and Litnik Shore; along with locations that are on Afognak or Shuyak islands but are lumped together with other areas and published as boat other, shoreline other, other remote streams, and other lakes in the published SWHS report.

Table 26.-Creel survey statistics for selected sport fisheries for coho salmon on Afognak and Shuyak islands, 1987, 1990.

Year	Location	Effort	Harvest	Release
1987 [a]		(Angler-hours)		
	Portage Creek	1,972	589	
	Pauls Bay	729	159	
	Big Bay	427	378	
	Carry Inlet	289	106	
	Shangin Bay	107	92	
	All Sites	3,524	1,324	
1990 [b]		(Angler-Hours)		
	Afognak Lagoon	3,700	3,010	1,016

[a] Murray 1988b.

[b] Schwarz and Sonnichsen 1991.

estimated anglers expended 3,700 angler-hours and harvested 3,010 coho salmon. An estimated 1,020 coho were released.

The 1990 SWHS estimate for the entire Afognak/Shuyak Island area was 3,100 coho salmon (Table 25). Again, this estimate cannot be compared to the creel survey estimate because the creel survey estimate was just for a portion of the total Afognak/Shuyak islands area. The 1990 mail survey estimate for Afognak/Shuyak was probably low since the Afognak Lagoon creel estimate was almost identical to mail survey for the entire area. However, the closeness of these two estimates shows that the mail survey serves as an order-of-magnitude estimator for the Afognak/Shuyak islands coho salmon fisheries.

Recent Fishery Performance

The sport harvest of 3,860 coho salmon from Afognak/Shuyak islands waters during 1997 was slightly above the 1988-1996 average (Table 25). This harvest accounted for 15% of the total coho salmon harvest from KMA waters during 1997. In addition to the harvest of 3,860 coho salmon, 9,610 coho salmon were estimated to have been caught and released by sport anglers fishing Afognak/Shuyak Island waters during 1997 (Howe et al. 1998). Based on this, anglers released an estimated 71% of the coho salmon they caught fishing Afognak/Shuyak Island waters during 1997.

Sport fishing opportunities for coho salmon in the Afognak/Shuyak Island area were good during 1997, especially in Litnik, Pauls Bay, Discoverer Bay, Marka Bay, and Shuyak Island. Returning coho were abundant in all these systems. Creel census data from Pauls and Discoverer bays documented harvests of 800 and 490 coho, respectively (Tables 27 and 28). Increased sport fishing opportunities near the Kitoi Bay hatchery on Afognak Island have been available since 1997, when hatchery production of coho was expanded. Complete harvest information for the 1998 season is not available at this time, but the harvest is expected to be similar to 1997.

Recent Board of Fisheries Actions

The Alaska Board of Fisheries adopted a public proposal at its December 1995 meeting that allows anglers in the remote area to have two daily bag limits of salmon other than chinook salmon in their possession. In the past, anglers were limited to 5 salmon other than chinook salmon in their possession. Beginning in 1996, anglers were allowed 10 in their possession.

At its January 1999 meeting, the Board closed water around the Kitoi Bay hatchery net pen as well as waters outside the net pen area to sport fishing. This was done to help ensure that the hatchery could collect brood stock and that the sport fishery and hatchery egg collection could take place in an orderly manner. All waters seaward of the terminus of Big Kitoi Creek to a straight line extending northwesterly from 58.11’ 42”N. lat., 152.21’95” W. long. to 58.11’59”N. lat., 152.22’03” W. long. are closed to sport fishing year-round.

All waters seaward of that same line to the longitude of 152.21’55” are closed to all sport fishing from August 15 through September 30. In order to keep closed water dates consistent, dates for existing closed waters around Little Kitoi Creek were changed to August 15 through September 30, from August 15 through September 15.

“No Fishing” markers will be erected at these locations. In addition, a diagram of the closed water areas and dates will be provided in the 1999 regulation book.

The Board also took action at their January 1999 meeting to resolve a conflict between commercial and sport fishermen fishing for coho in Pauls Bay. Commercial closed water restrictions were relaxed by regulation (5 AAC 18.350 (a) (6) (D)). On August 1, commercial fishermen are allowed to fish within approximately 550 yards of the stream mouth (east of a line from 58°23.70’N lat., 152°20.80’W long., to 58°23.29’N lat., 152°21.09’W long). Relaxing closed waters will allow commercial fishermen to harvest a portion of the coho as they arrive. This will help prevent exceeding escapement goals and creating large build ups of coho in waters closed to commercial fishing directly in front of Pauls Creek. In the past, this situation resulted in commercial stream mouth openings that allowed for the commercial harvest of surplus fish, but denied the sport fishery access to fish after the commercial harvest.

In addition to changing commercial closed waters, the Board modified the North Afognak/ Shuyak Island Salmon Management Plan, (5 AAC 18.368. (c)). The modification states, “The department shall manage the Pauls Creek coho salmon escapement based on interim escapement goals, as determined by the department. When interim escapement goals are exceeded, the commissioner may reduce, by emergency order, the closed waters described in 5 AAC 18.350 (a) (6) (D), to east of 152°20.80’W long.” This provision allows for the commercial harvest of surplus fish on years when escapement goals have been achieved and there are large quantities of fish within the regulatory closed water. However, the existing closed waters are only reduced by

Table 27.-Daily summary for all angler effort, coho salmon harvested and coho salmon released for saltwater sport fishing at Paul's Bay, Afognak Island, August 9 through September 3, 1998.

	Angler Effort (Days)		Coho Harvest		Coho Release	
Date	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative
09-Aug	14	14	50	50	55	55
10-Aug	6	20	12	62	15	70
11-Aug	13	33	33	95	126	196
12-Aug	14	47	27	122	55	251
13-Aug	7	54	10	132	43	294
14-Aug	10	64	22	154	34	328
15-Aug	13	77	40	194	134	462
16-Aug	15	92	45	239	163	625
17-Aug	8	100	22	261	101	726
18-Aug	4	104	20	281	50	776
19-Aug	18	122	52	333	112	888
20-Aug	15	137	42	375	77	965
21-Aug	25	162	86	461	143	1,108
22-Aug	31	193	63	524	140	1,248
23-Aug	20	213	41	565	52	1,300
24-Aug	10	223	20	585	0	1,300
25-Aug	14	237	41	626	43	1,343
26-Aug	18	255	38	664	13	1,356
27-Aug	17	272	32	696	18	1,374
28-Aug	6	278	22	718	0	1,374
29-Aug	10	288	26	744	0	1,374
30-Aug	10	298	33	777	0	1,374
31-Aug	0	298	0	777	0	1,374
01-Sep	4	302	18	795	0	1,374
02-Sep	7	309	8	803	1	1,375
03-Sep	2	311	1	804	3	1,378
Total[a]	311		804		1,378	

[a] Sixty-five percent of the effort occurred from charter boats. Charter boats accounted for 85% of the harvest and 75% of the releases. Seventy-five percent of the anglers were nonresidents. Ninety-one additional angler-days were expended at Pauls Lake, resulting in 12 coho harvested and 420 released.

Table 28.-Daily summary of all angler effort, coho salmon harvested and coho salmon released for saltwater sport fishing at Discoverer Bay, Afognak Island, August 9 through September 6, 1998.

	Angler Effort (Days)		Coho Harvest		Coho Release	
Date	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative
09-Aug	11	11	52	52	200	200
10-Aug	5	16	25	77	0	200
11-Aug	5	21	25	102	0	200
12-Aug	4	25	6	108	7	207
13-Aug	4	29	11	119	11	218
14-Aug	12	41	10	129	5	223
15-Aug	14	55	30	159	23	246
16-Aug	17	72	49	208	4	250
17-Aug	21	93	21	229	38	288
18-Aug	19	112	18	247	75	363
19-Aug	14	126	8	255	64	427
20-Aug	8	134	30	285	32	459
21-Aug	11	145	12	297	91	550
22-Aug	9	154	35	332	43	593
23-Aug	9	163	22	354	55	648
24-Aug	18	181	30	384	109	757
25-Aug	8	189	0	384	105	862
26-Aug	7	196	14	398	36	898
27-Aug	7	203	20	418	37	935
28-Aug	4	207	0	418	35	970
29-Aug	6	213	10	428	50	1,020
30-Aug	12	225	10	438	6	1,026
31-Aug	6	231	0	438	0	1,026
01-Sep	0	231	0	438	0	1,026
02-Sep	0	231	0	438	0	1,026
03-Sep	6	237	18	456	85	1,111
04-Sep	6	243	10	466	65	1,176
05-Sep	6	249	6	472	56	1,232
06-Sep	14	263	15	487	35	1,267
Total[a]	263		487		1,267	

[a] Twenty-nine percent of the effort occurred from charter boats. Charter boats accounted for 35% of the harvest and 24% of the releases. Seventy-eight percent of the anglers were nonresidents.

approximately one-third, which leaves a closed area near the stream mouth where fish can not be commercially harvested. This provision will help ensure that there will be some fish available to the sport fishery after commercial harvests take place.

Management Objectives

Management objectives for this fishery are to provide angling opportunities at a level that can be supported by the fishery resource.

Current Issues

The two main coho drainages in Perenosa Bay are Pauls Bay and Discoverer Bay. There is a weir at Pauls Bay. The regulatory closed waters for the commercial salmon fishery at Pauls Bay are 0.5 statute miles from the stream mouth. This large closed area was intended to protect and rebuild the sockeye salmon run, which is over by the end of July. Due to the efficiency of the commercial fleet and the build-up behavior of coho salmon, the commercial fisheries staff has been conservative in prosecuting terminal and near-terminal coho salmon fisheries until assured of achieving escapement goals. In recent years, this strategy coupled with the large regulatory closed waters has resulted in large build-ups of coho salmon in late August.

From 1992–1997, the Commercial Fisheries Division annually reduced closed waters in Pauls Bay to harvest surplus coho salmon once the upper end of the escapement goal range was assured. Markers were moved near the mouth of the stream, to permit a harvest of surplus fish by the commercial fishery. Allocative conflicts between the sport charter operators and commercial fishers during stream-mouth openings developed at Pauls Bay during late August. Sport fishermen claimed that these openings removed all the coho salmon and eliminated sport fishing opportunity after the openings.

During 1998, the Commercial Fisheries Division reduced closed waters in late August, however rather than a stream mouth opening, closed water markers were placed approximately 500 yards to the north and 300 yards to the west. This allowed the commercial fishery to mop-up most of the coho surplus, but also allowed the sport fishery to continue to fish on coho in waters that remained closed to commercial fishing.

Actions taken to resolve proposals 76 and 121 are described in the section on Recent Board of Fisheries Actions.

As more adult coho return from increased releases at the Kitoi Bay hatchery, it is quite likely that sport fishing will increase in Kitoi Bay. Hatchery staff are concerned that the brood stock be protected, contained, and collected in an orderly manner. Proposal 76 was submitted for the January 1999 Board meeting by the Kodiak Regional Aquaculture Association, and proposed closing waters to sport fishing so their concern can be addressed.

A public proposal (#121) was submitted for consideration by the Board of Fisheries at their January 1999 meeting to change the North Afognak/Shuyak Island Salmon Management Plan. The proposal recommended adding the goal of providing a safe sport fishery, with sport fishing opportunities during the entire duration of the coho return.

Ongoing Research and Management Activities

The Sport Fish Division conducted a creel census in Perenosa Bay in 1998. A creel census camp was located at both Pauls Bay and Discoverer Bay (Figure 11). All anglers exiting the fishery were interviewed for catch and effort information.

From August 9 through September 3 in Pauls Bay, 311 anglers harvested 800 coho and released 1,380 (Table 27). Sixty-five percent of the effort occurred from charter boats and that effort accounted for 85% of the harvest and 75% of the releases. Seventy-five percent of the anglers were nonresidents (Table 27).

From August 9 through September 6 in Discoverer Bay, 263 anglers harvested 490 coho salmon and released 1,270 (Table 28). Only 29% of the effort were from charter boats, and that effort accounted for 35% of the harvest and 24% of the releases. Seventy-eight percent of the anglers were nonresidents. A Fishery Data Series report that documents the complete result of this census is being compiled (Begich and Schwarz *In prep*).

Outlook

There are no formal forecasts for coho returns on Kodiak Archipelago. However, both commercial coho catches and escapements were at record levels during 1997 and 1998, indicating record returns. Parent year escapements were also above average. Unless survival conditions change from recent years, coho returns are expected to be above average in 1998. Adult returns of coho in 1998 from Kitoi Bay hatchery smolt releases are expected to be near 120,000 fish, which will add to the abundance of coho salmon in salt water around the island and in Kitoi Bay.

Inseason Management Approach

There are currently four weirs that count coho on Afognak and Shuyak islands (Table 29). The sport fishery will be managed so that harvests do not jeopardize achievement of escapement goals. The sport fish management biologist will stay in contact with the Kitoi Bay hatchery manager to make sure the sport fishery does not impact brood stock collection.

Recommended Research and Management Activities

Marka Bay on Afognak Island supports a small but popular coho salmon fishery. There have been increasing complaints of crowding and bag limit violations in this fishery. Monitoring this fishery and collecting information on escapement is warranted at current use levels.

Other KMA Coho Salmon Recommended Research

The National Park Service reported that sport fishing for coho salmon at Big River, which is near Swikshak Beach on the Alaska Peninsula, has increased in the past few years. During 1998 they monitored the fishery and noted that most of the effort originated from lodges in the Bristol Bay area. One bear incident was noted and included the discharge of a firearm, which is prohibited within Katmai National Park & Preserve. Meeting with the Park Service to discuss fisheries monitoring and park regulations as well as visiting the fishery for familiarization is recommended.

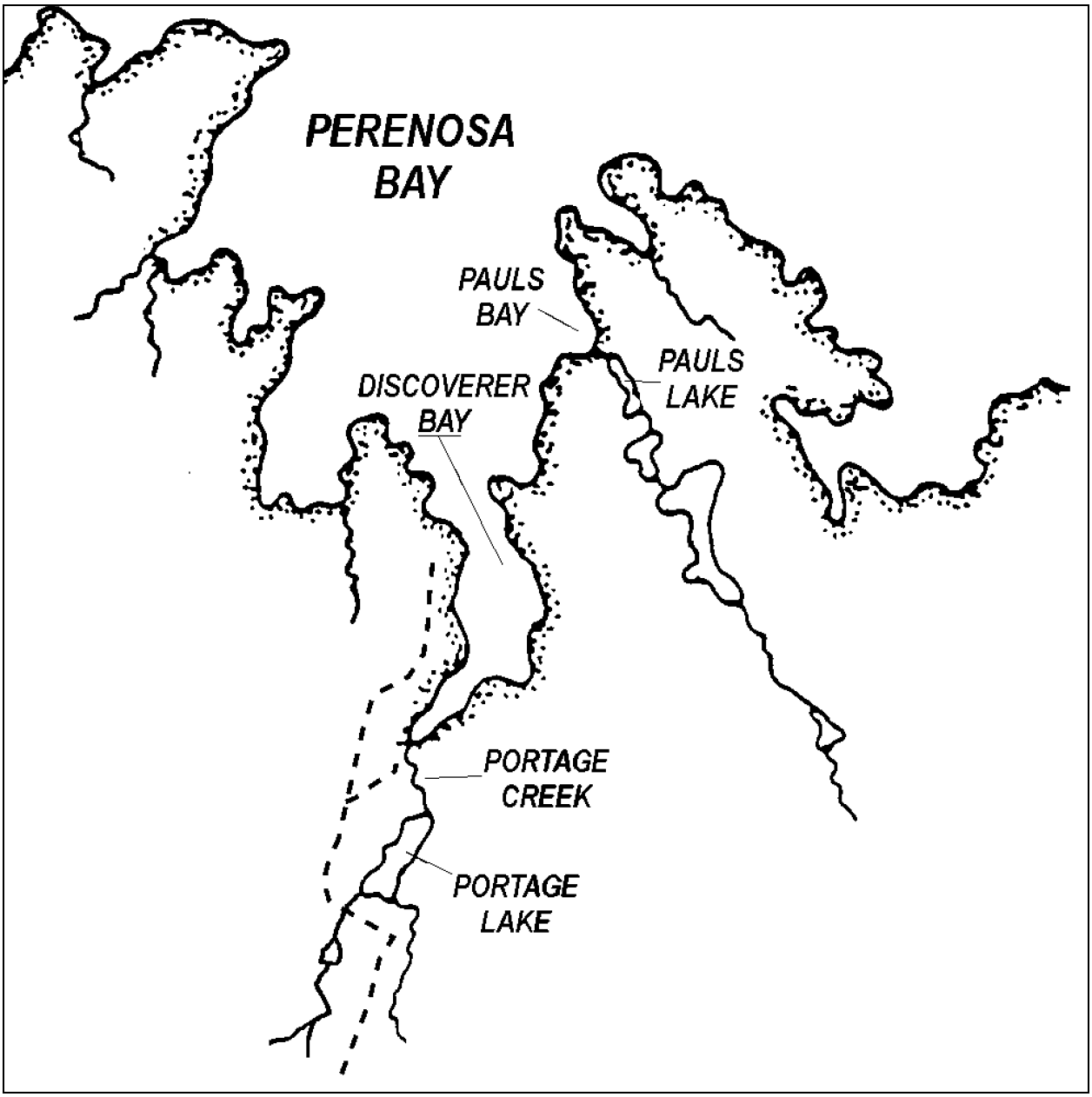

Figure 11.-Map of Perenosa Bay.

Table 29.-Coho salmon counts at weirs on Afognak and Shuyak islands, 1985-1998.

Year	Afognak		Pauls Bay		Portage Creek		Big Bay[a]		Bear Creek[a]	
	Number of Coho	Last Day of Operation	Number of Coho	Last Day of Operation	Number of Coho	Last Day of Operation	Number of Coho	Last Day of Operation	Number of Coho	Last Day of Operation
1985	13,847	29-Sep	9,535	12-Sep						
1986	5,082	28-Sep	9,403	3-Sep						
1987	11,469	24-Sep	4,767	11-Sep	3,710	20-Sep			833	23-Sep
1988	9,772	9-Sep	5,563	3-Sep	2,354	4-Sep	1,771	2-Oct	967	6-Sep
1989	13,050	20-Sep	7,919	10-Sep	5,928	28-Aug	1,799	11-Sep	441	7-Sep
1990	13,380	17-Sep	3,668	7-Sep	4,277	8-Sep	1,535	30-Sep	926	15-Sep
1991	14,409	8-Sep	Not operated				2,823	28-Sep	Not operated	
1992	16,415	15-Sep	Not operated				931	18-Sep	925	8-Sep
1993	6,637	12-Sep	10,664	2-Sep			2,281	25-Sep	2,048	6-Sep
1994	11,965	18-Sep	12,538	6-Sep			2,065	26-Sep	Not operated	
1995	10,542	12-Sep	10,663	8-Sep			1,971	18-Sep	2,456	17-Sep
1996	9,856	11-Sep	15,491	11-Sep			916	14-Sep	2,482	10-Sep
1997	10,908	13-Sep	8,280	28-Oct					3,138	20-Sep
1998	16,374	9-Sep	15,514	11-Sep			1,494	12-Sep	1,202	12-Sep
Average	11,693		9,500		4,067		1,759		1,542	

[a] Big Bay and Bear Creek weirs are located on Shuyak Island.

KARLUK AND AYAKULIK (RED) RIVERS FISHERIES

The Karluk and Ayakulik (also known as Red) rivers are located on the southwest end of Kodiak Island (Figure 12). Anglers fishing the Karluk River typically gain access to the river in one of three fashions. Anglers fly into the village of Karluk via either float or wheel plane and subsequently fish Karluk Lagoon and the lower Karluk River (Figure 12). Others fly into Karluk Lake and float the Karluk River downstream either to the portage or all the way downstream to Karluk Lagoon. Finally, access may be gained by flying into the portage reach of the Karluk River via float plane. Anglers accessing the river in this manner either fish just this reach or float down to the lagoon. Anglers fishing the Ayakulik River (Figure 12) typically gain access to the fishery by float-equipped aircraft. The major access location on the upper Ayakulik is at the confluence of the Ayakulik and Bare Creek. The Karluk and Ayakulik rivers support native stocks of steelhead trout and all five species of North American Pacific salmon. Chinook and coho salmon are the preferred salmon species, but both rivers have large runs of sockeye and pink salmon which are also harvested by anglers.

KARLUK AND AYAKULIK RIVERS STEELHEAD TROUT FISHERIES

Historical Perspective

Sixteen river systems on Kodiak and Afognak islands are known to support populations of steelhead trout (Figure 13), of which the Karluk and Ayakulik rivers support the largest populations. Steelhead trout returning to the Karluk and Ayakulik rivers are fall-run fish which begin entering the lagoon and lower river in mid-August and may continue immigration through the winter months. The peak of the run occurs in late October. The majority of spawning takes place from April through early June.

Daily bag and possession limits for steelhead/rainbow trout in the remote portions of the Kodiak Regulatory Area (including the Karluk and Ayakulik rivers) are 2 fish, only 1 of which may be 20 inches or more in length. Fishing for steelhead trout in flowing waters is closed from April 1 through June 14 to protect spawning fish.

From 1991 through 1997, the Division of Sport Fish conducted a comprehensive research project on the Karluk River steelhead population. This study investigated the magnitude of the incidental commercial harvest of steelhead from marine waters near the Karluk River. The study estimated sport harvest, documented subsistence harvest and estimated the number of spawning adult steelhead in the Karluk for the 1992 through 1996 spring spawning populations. In 1994 and 1995 the study was expanded to include an onsite autumn angler survey. The complete results of this study are presented in Begich (1992, 1993, 1995, 1995a, 1995b, 1997) and in a Thesis presented by Begich entitled “Population Ecology of Adult Steelhead Trout of the Karluk River, Alaska” (Begich 1999).

From 1988 through 1997, SWHS estimates of sport harvest averaged 80 and 60 steelhead trout from Karluk and Ayakulik rivers drainage waters, respectively (Table 30). Harvests from these two rivers have accounted for nearly 35% of the steelhead harvest in the Kodiak Regulatory Area. The Karluk River supports the largest fishery, but effort on the Ayakulik River has increased in recent years.

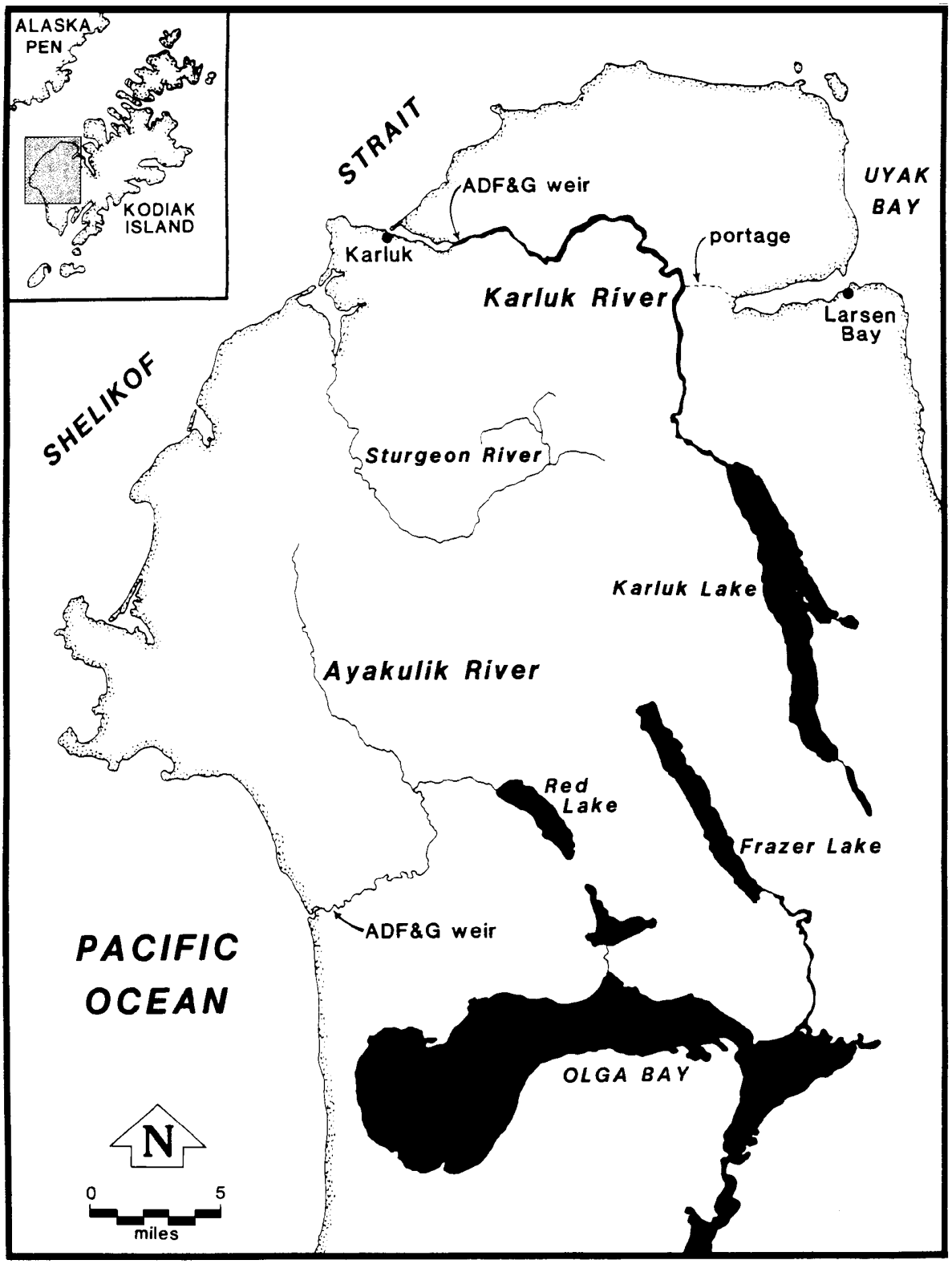

Figure 12.-The Karluk and Ayakulik rivers.

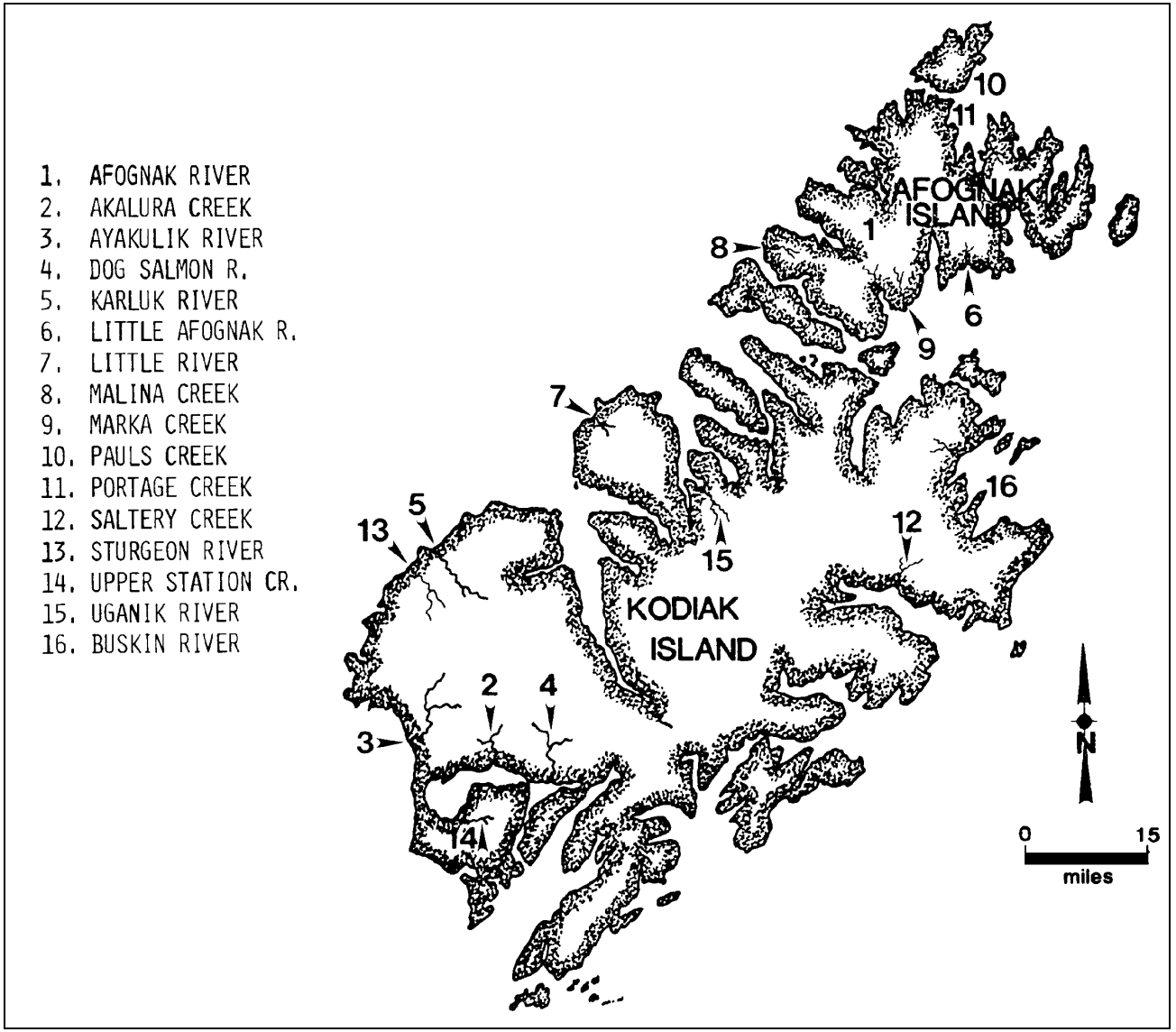

Figure 13.-Locations of steelhead trout stocks on Afognak and Kodiak islands.

Table 30.-Harvest of steelhead trout from the Karluk and Ayakulik (Red) river drainages, 1988-1997.

	Karluk River		Ayakulik River		Total KRA
Year	Harvest	Release	Harvest	Release	Harvest[a]
1988	109		91		853
1989	30		279		778
1990	86	1,053	17		1,120
1991	148	961	96	228	327
1992	40	898	16	418	96
1993	189	3,446	0	2,000	433
1994	80 [b]	1,387	46	869	234
1995	47	1,040	0	511	94
1996	24	717	7	361	38
1997	13	1,396	62	934	75
Average	77	1,362	61	760	405

Note: Reported catches of rainbow trout from the Ayakulik and Karluk drainages are assumed to be steelhead. The rainbow trout populations in these drainages are so small, relative to the steelhead populations, that reported rainbows are probably misidentified steelhead.

[a] This harvest estimate is calculated by adding the steelhead reported in the Statewide Harvest Survey under Saltwater Total, Karluk, Ayakulik (Red), Saltery, Other Streams, and Other Lakes. Rainbow trout reported in the Karluk and Ayakulik rivers are also counted as steelhead. Steelhead reported under roadside lakes are considered to be rainbow trout.

[b] In 1994 a creel census was conducted on the Karluk River during the chinook salmon and steelhead return. A total of 5 and 268 steelhead were harvested and released, respectively, during the June chinook fishery.

Sport harvest of steelhead at the Karluk River is low. Approximately 94% of all steelhead caught since 1990 have been released. Angler participation in the Karluk increased during the early 1990s. After the 1993 sport fishery it was apparent that reports of good steelhead fishing on the Karluk were circulating among anglers. In anticipation of increased angling effort during the 1994 season, a department tent camp was established on the Karluk Portage so that the fishery could be monitored. From October 4 through November 11, 1994, 538 angler-days were expended to harvest 21 steelhead with a release of 2,598 (Begich 1995b). Five steelhead were caught per angler-day.

The creel survey at the portage was repeated in 1995. From September 29 through November 5, 612 angler-days were expended to harvest 32 steelhead and release 2,466.

This fall census did not include the June catch of steelhead kelts which occurs incidentally during the chinook salmon fishery. In 1994 a creel census for chinook salmon was conducted at the Karluk Portage and weir. During the chinook census anglers were also asked if they caught any steelhead. A harvest of five steelhead and a release of 268 fish were documented, indicating that steelhead kelts caught in June make up a very small portion of the total steelhead catch.

This brings the 1994 documented harvest to 30 steelhead and a release of 3,210 fish. Although this census represents most of the catch that took place, it should still be considered a minimum number because it does not account for catches that were made in Karluk Lagoon. This documented catch compares with a much lower estimate from the Statewide Harvest Survey of 80 steelhead harvested and a release of 1,387. The Statewide Harvest Survey draws its sample from anglers who purchased licenses between January 1 and September 30. This is done so that the survey can be completed in a timely fashion, and by that time most of the fishing for the year has been completed. However, the steelhead fishery is an exception because the main fishery occurs in October. Anglers who buy their licenses in October or November will not be included in the pool of sampled anglers. Because of this methodology, the Statewide Harvest Survey underestimates the Karluk steelhead fishing effort and catch. This is especially true because nonresidents who fish in October and November are likely not to purchase their licenses until they enter the state. Based on the 1994 and 1995 creel surveys, nonresident anglers accounted for 66% and 76% of the angler-days expended in the fishery. Nonresident anglers also accounted for 77% and 80% of the total steelhead catch.

Other sources of mortality for steelhead trout returning to these two rivers include incidental harvest in the commercial salmon fisheries along the Alaska Peninsula and southwest side of Kodiak Island, and the subsistence fisheries conducted by the residents of Karluk and Larsen Bay villages (Begich 1992, 1993, 1995, and 1997).

In 1991-1995, from August 15 through September 30, commercial purse seine and set gill net catches from selected waters along the southwest portion of Kodiak Island were sampled for the bycatch of steelhead trout. The total estimated harvest of steelhead trout in these fisheries was 705, 417, 41, 293 and 71 in 1991, 1992, 1993, 1994, and 1995, respectively (Begich 1992, 1993, 1995a, 1995b, 1997). It is probable that the steelhead harvest is composed of mixed stocks due to the proximity of other steelhead systems near the Karluk (Figure 12).

Between 1982 and 1998, eight subsistence surveys were conducted in Larsen Bay and seven in Karluk. A complete summary is provided in Appendices B1 and B2 of Begich 1997. Harvest ranged from 0 to 233 in Karluk, averaging 60 steelhead. Harvest ranged from 0 to 614 in Larsen Bay, averaging 200 steelhead.

The annual return of steelhead trout entering the Karluk and Ayakulik rivers is not known because weirs on both systems are not operated past September, when the majority of the immigration occurs. However, after overwintering and spawning, surviving post-spawn steelhead trout (kelts) emigrate downstream and pass through weirs located near the mouths of both rivers (Table 31). Kelt counts on the Karluk River have ranged from 210 to 7,014 (Table 31).

Table 31.-Counts of steelhead trout kelts from the Karluk and Ayakulik (Red) rivers drainages, 1981-1997.

Year	Karluk River	Ayakulik River
1981	2,194	1,108
1982	1,096	54
1983	4,203	1,351
1984	2,512	1,306
1985	1,924	693
1986	296	1,016
1987	687	727
1988	210	918
1989	611	789
1990	1,029	970
1991	1,475	910
1992	2,862	1,174
1993	4,259	1,517
1994	4,910	1,150
1995	7,014	1,134
1996	2,749	701
1997	6,928	733
Average	2,645	956

A 4-year trend of kelt counts beginning in 1986 indicated a declining population at the Karluk River (Figure 14). However, in recent years the number of emigrating kelts has increased, with the 1995 and 1997 counts being the highest on record. At the Ayakulik River, kelt counts have been stable, averaging 960 fish since 1981 with a 1997 count of 733 fish (Table 31, Figure 14).

Recent Fishery Performance

The Statewide Harvest Survey estimated the harvest and release of steelhead in the Karluk River in 1997 at 13 and 1,400 fish, respectively. The Ayakulik harvest and release was estimated at 60 and 930 steelhead, respectively. These estimates should be considered as minimum; actual catches are probably much larger for reasons explained above. Steelhead trout fisheries on the Karluk and Ayakulik rivers are primarily catch-and-release. Since 1991 approximately 94% of all steelhead trout caught on both rivers were released. The current bag and possession limits for steelhead trout over 20 inches are 1 fish. This regulation, coupled with the remote location of the rivers and a lack of public facilities for freezing fish, dictates a low retention rate.

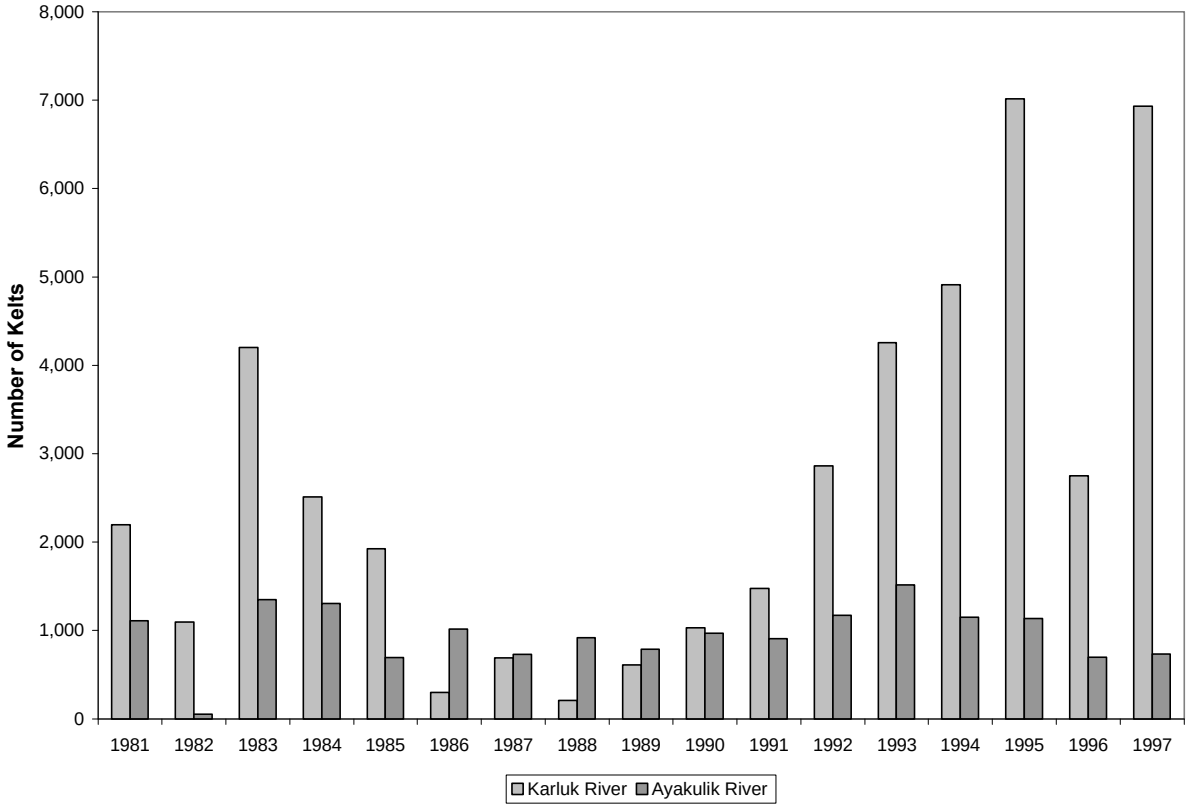

Figure 14.-Steelhead kelt counts from the Karluk and Ayakulik river weirs, 1981-1997.

Effort and catch estimates for 1998 are not available from the Statewide Harvest Survey at this time; however, anglers reported catches similar to slightly below the past few years. The Karluk and Ayakulik rivers currently have the potential to generate some of the highest steelhead catches in the state of Alaska. Figure 11 and Table 29 in the 1996 Annual Management Report (Schwarz 1997) show that the Karluk and Ayakulik rivers produced the fourth and fifth largest catches of steelhead in the state in 1993 and 1994. Future trends in sport catch and effort will depend upon several factors, including maintenance of current steelhead abundance levels, public access, and public awareness of the quality of these steelhead trout fisheries. The Karluk/Ayakulik steelhead fisheries are definitely examples of level III fisheries, with a high cost of participation and a low yield in terms of harvested fish. In order for this fishery to continue to grow, there must be anglers willing to pay the price of getting to these fisheries and braving what is typically poor weather conditions with very limited camping facilities, especially on the Ayakulik River. Even if effort in these fisheries does not grow, these fisheries provide diversity in the KMA, offering anglers an uncrowded, remote experience with excellent fishing for steelhead trout.

Management Objectives

Specific fishery objectives have not been formally established for Karluk and Ayakulik rivers steelhead trout fisheries to date. However, an assumption of past and current fisheries management has been to follow the guidelines set forth in the Cook Inlet and Copper River Basin Rainbow and Steelhead Trout Management Policy for wild stocks of steelhead trout

(ADF&G 1986). This policy provides future Fisheries Boards, staff managers, and the sport fishing public with:

1. Management policies and implementation directives for area rainbow and steelhead trout fisheries;
2. A systematic approach for developing sport fishing regulations that includes a process for rational selection of waters for special management such as catch-and-release, trophy areas, and high yield fisheries; and
3. Recommended research objectives.

A primary research objective is to establish a relationship between spawning population size and spring kelt counts. Once this relationship is established, monitoring the size of the spawning population will be possible through examining kelt counts.

Recent Board of Fisheries Actions

During the December 1995 Board of Fisheries meeting in Kodiak, the Board rejected a public proposal that would have prohibited the use of bait in fresh water of the Kodiak remote zone. The Department's position on this proposal was that it was too broad and applied to too many species. The Department stated that although we were opposed to the proposal, we were not opposed to prohibiting the use of bait in specific streams for specific species as identified through a planning process used to develop special use areas. Steelhead stocks on Kodiak Island are the most likely candidates for special use plans.

During the January 1999 Board of Fisheries meeting, the Board rejected two public proposals that affected methods and means on the Karluk and Ayakulik rivers. One proposal requested that artificial lures with single hooks be the only legal sport fishing gear in the Karluk River. The second proposal requested that only artificial flies be allowed on the Ayakulik River. The local advisory committee was opposed to these proposals because the fish stocks were abundant in these two rivers and the proposals were viewed as unnecessarily restrictive. The Department's comments were that the current levels of sport harvest were not threatening the sustainability of the fish resources in these rivers, and eliminating bait and multiple hooks was not needed as a conservation measure. The proposals spoke to changing the quality and nature of the fishery, which falls under the jurisdiction of the Board of Fisheries. The department was neutral in this aspect of the proposal. The department will work with anglers who are interested in developing special use areas, following the guidelines used in the Cook Inlet and Copper River Basin Rainbow and Steelhead Trout Management Policy for wild stocks of steelhead trout.

Current Issues

Kelt counts declined in the late 1980s on the Karluk River (Table 31). In response to this decline, the Division of Sport Fish initiated a research project on the Karluk River. The abundance of steelhead, as indicated by kelt counts, began to increase in 1990, and the 1995 and 1997 counts of 709 and 6,930, respectively, were the highest on record. This rebound in steelhead trout abundance is encouraging and makes additional sport fisheries restrictions for stock preservation unnecessary at this time.

Annual subsistence harvests by residents of Larsen Bay village averaged 400 steelhead trout from April of 1990 through March of 1994 (Begich 1997). This is a rod-and-reel fishery which occurs during the winter and spring months. State regulations do not designate rod and reel as a legal

gear type for subsistence fishing on Kodiak Island. Federal regulations do allow rod and reel as a legal gear type but disallow the taking of steelhead as a subsistence species on Kodiak Island. Federal regulations do not apply on the Karluk River because the land is privately owned. It has been documented through department surveys that this subsistence fishery has existed for several years, and takes place in the spring when the sport fishery is closed. A program to inform participants that the fishery is illegal and to explain the regulatory process should be undertaken. State regulations allow for the retention of incidentally-caught steelhead in legal subsistence net fisheries. This regulation makes the Karluk Lagoon steelhead subsistence harvest legal.

Maintaining effective kelt emigration through salmon counting weirs is essential. Repeat and multi-repeat spawners add significantly to future years' fishery and spawning populations (Table 32). In addition, repeat spawners are larger fish which are a desirable component of the sport fishery (Begich 1995). Delayed downstream passage due to weirs results in increased mortality to kelts. Downriver passages or traps have proven effective, and aluminum traps have been built and incorporated into the weirs on the Karluk River since 1992 and since 1993 on the Ayakulik River. These traps provide an opening in the weir for fish moving downstream. Once the steelhead enter the trap they can be sampled and released downstream.

A spawning ground closure from April 1 through June 15 is in effect on all flowing waters within the Kodiak Archipelago for steelhead/rainbow trout. This closure was designed to protect spawning fish. Consideration for establishing a fishery for steelhead in the Karluk River during the current spawning ground closure may be warranted due to record high abundance observed during the past several years.

A paramount concern involves maintaining adequate angler access to these recreational fisheries as native owners and the Kodiak National Wildlife Refuge develop their land management strategies.

Ongoing Research and Management Activities

All steelhead kelts emigrating downstream through the weir on the Karluk River are counted. Kelts are sampled for sex and length so that by using spawning survival from logistic regression model (Begich 1999), the abundance of the spawning population can also be estimated. Scales are collected from some kelts so that age composition can be determined if ever desired.

Biological Data

Population estimates of spawning steelhead in the Karluk River were made from 1992 to 1997 (Table 32). These estimates ranged from 4,110–10,800, averaging 8,110 steelhead. The majority of the population has been composed of initial spawners, ranging from 78% to 87%, and averaging 82% since 1992. Repeat spawners have accounted for less than 20% of the population. Sampling at the Ayakulik began in 1993. The Ayakulik kelt emigration has averaged 68% initial spawners (74%, 66% and 64% initial spawners in 1993, 1994, and 1995, respectively).

Table 32.-Karluk River steelhead spawning population research summary, 1992-1997.

Year	Spawning Population Size[a]	Sex Composition		Initial Spawners	Repeat Spawners	Multi Repeat Spawners	Spawning Survival		Previous Year's Fall Weir Count[b]
		Male	Female				Number	%	
1992	4,107 (±134)	NA[c]	NA	3,203	739	165	2,752	67%	339
1993	7,026 (±308)	2,339 (±302)	4,687 (± 461)	6,113	843	70	4,075	58%	356
1994	9,116 (±522)	4,928 (±680)	4,188 (±629)	7,384	1,641	91	4,649	51%	852
1995	10,801 (±437)	4,174 (±641)	6,629 (±760)	8,965	1,620	217	6,697	62%	1,145
1996	7,252 (± 674)	4,070	3,128	5,972	1,109	171	2,605	36%	1,535
1997	10,377 (± 329)	NA	NA	NA	NA	NA	6,849	66%	813

Source: Begich 1992, 1993, 1995a, 1995b, 1997, 1999.

[a] (±) is the standard error.

[b] This number is the weir count as of September 23. During most years the weir operated up to this date, and selecting a common date for each year allows a better comparison than comparing the end of the season count.

[c] Not available.

Spawning survival has ranged from 36% to 67%, averaging 57%. The Karluk steelhead population had fish present from 15 age groups. The dominant age groups for the spawning population are 2.3, 2.3s2, and 2.2[1]. A 2.3-aged fish is a fish that has spent 2 years in fresh water and 3 years in salt water. Unlike salmon, steelhead only spend a few months in gravel before they emerge as fry (May and June). A 2.3 aged steelhead is 5 years old. The Ayakulik steelhead population has the same dominant age classes.

Recommended Research and Management Activities

The directed fall Karluk steelhead fishery has not been monitored since the 1995 creel survey. This fishery should be visited to make general observations on effort levels, gear use, and harvest practices. The Statewide Harvest Survey is not reliable in estimating effort and catch figures in this fishery for reasons stated in Historical Perspective.

A method to improve the way the Statewide Harvest Survey estimates the Kodiak steelhead catch should be investigated.

The possibilities of creating a sport fishery for steelhead on the Karluk River during the current closed season of April 1–June 15 should be evaluated.

KARLUK AND AYAKULIK RIVERS CHINOOK SALMON FISHERIES

Historical Perspective

The Karluk and Ayakulik (Red) rivers support the only populations of native chinook salmon in the Kodiak Regulatory area. Chinook salmon return to the Karluk and Ayakulik rivers from late May through mid-July with 50% of the immigration usually passing the weirs located in the lower rivers by June 15. Chinook salmon in the Karluk River spawn from the outlet of Karluk Lake downstream to just above the lagoon. Few, if any, chinook salmon enter Karluk Lake or the tributaries to the lake. Spawning occurs from August through mid-September. The distribution of spawning chinook salmon in the Ayakulik River begins just above tide water and extends upriver. One of the major spawning tributaries is a fork on the Ayakulik just upriver from the Red River. Few fish, if any, enter Red Lake. Spawning occurs from late July through late August. Fishing for chinook salmon is currently open year-round throughout both the Karluk and Ayakulik rivers. The bag and possession limits are 3 fish, only 2 of which may be over 28 inches. In addition, there is a provision which allows the harvest of 10 chinook salmon under 20 inches in length.

The Statewide Harvest Survey (Mills 1979-1994, Howe et al. 1995-1998) provides estimates of harvest for the recreational fisheries in these waters. Complete or partial creel surveys were also conducted in both rivers during 1993 and 1994 (Schwarz 1996). Chinook salmon bound for both the Karluk and Ayakulik rivers are also harvested in commercial and subsistence fisheries. The estimated annual sport harvest of chinook salmon from the Karluk and Ayakulik rivers from 1983 through 1997 averaged 840 and 450 fish, respectively (Table 33). The largest estimated harvest was 1,630 in the Karluk River and 1,000 in the Ayakulik River, both in 1993.

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[1] The "s" in the age designation indicates that the fish spawned. This is evident by the presence of a spawning check that occurs when the fish partially reabsorbs some of its scale during spawning. After spawning the fish may survive and return to sea. After a period at sea, the fish will return again to spawn and will be termed a repeat spawner. So, for example, the fish that was designated a 2.3s2 age was a fish that spent 2 years in fresh water, spent 3 years in salt water, returned to the river and spawned, returned to sea for 2 years, returned to the river and was sampled shortly before spawning again. This fish was about to become a repeat spawner after it had spawned the second time.

Escapement of chinook salmon into the Karluk and Ayakulik rivers is enumerated through weirs located near the terminus of each river. Weir counts of chinook salmon in the Karluk River have averaged approximately 10,860 fish during the past 14 years (1985-1998), with individual year's totals ranging from 4,430 to 14,440 (Table 34). In the Ayakulik River, weir counts of chinook salmon have averaged approximately 12,410 fish during the same period, with individual year's totals ranging from 6,370 to 21,370 (Table 34). Based on these weir counts, the exploitation rate of the inriver sport fishery has been low, averaging 8% in the Karluk and 4% in the Ayakulik.

Sport harvest has been a minor component of the chinook salmon resource exploitation (Table 34). Exploitation of the total inriver chinook salmon return has averaged 8% on the Karluk River and 4% on the Ayakulik River. However in 1993 on the Ayakulik River only 7,819 chinook were counted through the weir. The sport harvest in 1993 was 1,004 fish, with 4,422 released (Mills 1994). Assuming hook-and-release mortality of 7% (Bendock 1991), 310 released fish died. The spawning escapement was 6,505. This spawning escapement was only five fish above the minimum escapement level of 6,500 for the Ayakulik River.

In 1994, the Ayakulik River weir count was 9,138 chinook salmon. After the sport harvest of 948 is subtracted and an estimate is made for hook-and-release mortality (1,020 chinook salmon were released with an estimated mortality of 7%, or 72 fish), the spawning escapement was 8,118; only 1,618 fish above the minimum escapement goal. The commercial fishery adjacent to the Ayakulik River did not open in 1994 due to a weak sockeye return. The commercial fishery adjacent to the Ayakulik River (Statistical Areas 256-25, -20, and -10) has averaged a harvest of 3,007 chinook salmon over the 10-year period of 1987–1996 (Motis 1997). Had a commercial fishery and an average harvest of chinook occurred in 1994, the minimum escapement objectives would not have been met. An emergency order restricting the chinook salmon sport fishery has never been issued for the Ayakulik or the Karluk rivers. However, this may become necessary to achieve minimum spawning escapement levels during poor returns.

Recent Fishery Performance

Harvests of chinook salmon in 1997 from the Karluk and Ayakulik rivers were estimated by the Statewide Harvest Survey to be 1,560 and 920 fish, respectively (Howe et al. 1998). These harvests were about 600 and 400 fish above the recent 10-year average harvest. Additionally, 5,750 fish were released in the Karluk and 4,240 in the Ayakulik (Table 33).

Harvest figures for the 1998 season are not available from the SWHS yet, but anglers rafting through the Karluk weir in 1998 were interviewed for catch and effort information. A total of 279 anglers rafted through the Karluk weir, harvesting 386 chinook salmon (Table 35). In 1998 high water reduced the fishing effort as well as harvest and catch.

On the Ayakulik River, anglers rafting through the weir and those staying at the lodge next to the weir were interviewed for catch and effort information. A total of 86 anglers harvested 198 chinook salmon (Table 34). This is the lowest effort and harvest on record for the Ayakulik. Similar to the Karluk, the Ayakulik experienced floods that reduced both effort and harvest. The U. S. Fish and Wildlife Service maintains an enforcement camp at the upriver access location (the confluence of Bare Creek and the Ayakulik River) and monitors the sport fishery during June. They reported that fishing was very poor until June 16 when the river dropped

Table 33.-Sport effort and harvest of chinook salmon from the Karluk and Ayakulik (Red) river drainages, 1983-1997.

	Karluk River, Lagoon, and Lake				Ayakulik River, Red River, and Red Lake			
Year	Effort (Angler Days)	Harvest	Number Released	% of KMA Harvest	Effort (Angler Days)	Harvest	Number Released	% of KMA Harvest
1983	2,216	304		24	554	145		11
1984	1,339	187		16	1,272	437		37
1985	2,520	472		42	91	76		7
1986	657	122		15	229	76		9
1987	3,459	199		20	638	126		13
1988	2,128	819		38	377	600		28
1989	2,420	559		25	1,135	390		18
1990	2,969	700	2,262	61	759	252	2,394	22
1991	4,547	1,599	3,119	58	1,780	563	2,191	20
1992	5,430	856	2,754	39	3,340	776	3,199	35
1993 [a,b]	6,894	1,634	6,734	31	4,566	1,004	4,422	19
1994 [c]	10,948	1,483	2,174	45	5,473	948	1,029	29
1995	6,928	1,284	2,613	45	1,299	200	883	7
1996	6,237	769	1,613	28	2,038	203	591	7
1997	6,198	1,558	5,751	29	4,119	919	4,242	17
Average	4,326	836	3,378	34	1,845	448	2,369	19
1987-96 Average	5,196	990	3,038	39	2,141	506	2,101	20

Source: Mills 1984-1994, Howe et al. 1995-1998, and unpublished estimates from SWHS database.

[a] In 1993 a creel census at the Karluk weir and spit, and a creel survey of Karluk Lagoon estimated the harvest and release at 569 and 2,566, respectively. This was an incomplete estimate because it did not account for fishing which was conducted at the Portage (Schwarz 1996a).

[b] The USF&WS conducted a complete creel census on the Ayakulik River in 1993. Harvest and catch were documented at 808 and 2,878 chinook salmon, respectively (Schwarz 1996a).

[c] In 1994 a creel census above the Karluk weir documented a harvest of 896 chinook salmon. A creel census in the Ayakulik River documented a harvest of 739 chinook salmon (Schwarz 1996a).

Table 34.-Inriver returns and harvest of chinook salmon in the Karluk and Ayakulik (Red) rivers drainages, 1985-1998.

Year	Inriver Return	Harvestable Surplus	Sport Harvest[a]	Number Released[a]	Hook & Release Mortality[b]	% Surplus Harvested	Spawning escapement
KARLUK RIVER (mininum spawning escapement goal 4,500)							
1985	5,362	862	472			55	4,890
1986	4,429	0	122			100	4,307
1987	7,930	3,430	199			6	7,731
1988	13,337	8,837	819			9	12,518
1989	10,484	5,984	559			9	9,925
1990	14,442	9,942	700	2,262	158	9	13,584
1991	14,022	9,522	1,599	3,119	218	19	12,205
1992	9,601	5,101	856	2,754	193	21	8,552
1993	13,944	9,444	1,634	6,734	471	22	11,839
1994	12,049	7,549	1,483	2,174	152	22	10,414
1995	12,657	8,157	1,284	2,613	183	18	11,190
1996	10,051	5,551	769	1,613	113	16	9,169
1997	13,443	8,943	1,558	5,751	403	22	11,482
1998 [c]	10,239	5,739					
Average	10,856		927	3,378	236	25	9,831
AYAKULIK RIVER (minimum spawning escapement goal 6,500)							
1985	8,151	1,651	76			5	8,075
1986	6,371	0	76			100	6,295
1987	15,636	9,136	126			1	15,510
1988	21,370	14,870	600			4	20,770
1989	15,432	8,932	390			4	15,042
1990	11,251	4,751	252	2,394	168	9	10,831
1991	12,988	6,488	563	2,191	153	11	12,272
1992	9,135	2,635	776	3,199	224	38	8,135
1993	7,819	1,319	1,004	4,422	310	100	6,505
1994	9,138	2,638	948	1,029	72	39	8,118
1995	17,701	11,201	200	883	62	2	17,439
1996	10,344	3,844	203	591	41	6	10,100
1997	14,357	7,857	919	4,242	297	15	13,141
1998 [c]	14,040	7,540					
Average	12,410	5,919	472	2,369	166	26	11,710

[a] Harvest and release from Mills 1986-1994 and Howe et al. 1995-1998.

[b] Estimated mortality of 7% (Bendock 1991).

[c] Weirs washed out. Figures are estimates based on partial weir counts and sockeye to chinook ratios in the commercial catch.

Table 35.-Comparison of chinook salmon harvest and effort information obtained at weir sites with total river estimates obtained through the Statewide Harvest Survey and creel surveys, Karluk and Ayakulik rivers, 1991-1998.

Karluk River

	SWHS[a]		Creel Survey[b]		Interviewed at Weir			
Year	Harvest	Release	Harvest	Release	Number of Anglers	Angler-days	Harvest	Release
1991	1,599	3,119			162	Not available		
1992	856	2,754			235	807	340	840
1993	1,634	6,734	569 [c]	3,135 [c]	244	1,088	369	2,484
1994	1,483	2,174	896	4,347	501	1,650	493	3,386
1995	1,284	2,613			380	1,677	492	2,411
1996	769	1,163			329	1,727	406	2,996
1997	1,558	5,751			302	[d]	382	[d]
1998					279	[d]	386	[d]

Ayakulik River

	SWHS[a]		Creel Survey[b]		Interviewed at Weir and Lodge			
Year	Harvest	Release	Harvest	Release	Number of Anglers	Angler-days	Harvest	Release
1993	1,004	4,422	808	2,878	150	598	433	1,961
1994	948	1,020	739	2,733	203	926	477	1,898
1995	200	883			126	606	296	2,445
1996	203	591			135	446	292	1,299
1997	919	4,242			[d]	[d]	[d]	[d]
1998					86	398	198	[d]

[a] Mills 1992-1994, and Howe et al. 1995-1998.

[b] Schwarz 1996a.

[c] Incomplete survey, Karluk portage not surveyed.

[d] Information pending analysis.

significantly. Once the water level dropped fishing was good. Another factor that has reduced fishing effort on the Ayakulik River has been a change in the physical character of the lagoon. Three years ago a storm pushed beach gravel into the lagoon making it almost impossible for float planes to take off from the lagoon with anglers and their gear. Anglers who raft the river must exit via helicopter or be shuttled from the beach via Supercub.

Management Objectives

The primary management objective is to insure that spawning escapement goals (Karluk 4,500; Ayakulik 6,500) are met in both rivers. Three different Native Corporations own land along the Karluk and Ayakulik rivers. Negotiating leases, which will allow the department to operate counting weirs, is also critical to management of the fisheries resources. Management objectives also include providing angling opportunities at a level which the fishery resource can support. In order to maintain angling opportunities, public access is an important issue.

Recent Board of Fisheries Actions

The Board of Fisheries considered two public proposals at its December 1995 meeting that would have affected the chinook salmon fisheries in the Karluk and Ayakulik rivers. One proposal would have lowered the bag and possession limits for chinook salmon in fresh waters of the remote zone from 3 fish to 1 fish. The other proposal would have prohibited the use of bait in fresh waters of the remote zone. Neither of these proposals was adopted by the Board because the large returns of chinook salmon in recent years made reducing the sport fishery efficiency or harvest unnecessary for conservation purposes.

As discussed in the chapter on the saltwater chinook salmon fishery, annual chinook harvest limits would affect the sport fishery in the Karluk and Ayakulik rivers. Annual limits are still under consideration by the Board as described in saltwater chinook salmon chapter. Three additional proposals were considered at the January 15, 1999 Board of fisheries meeting: spawning ground season closures on both rivers for chinook salmon from July 25 through December 31, gear limitation to artificial lures with single hook on the Karluk River, and limitation to artificial flies on the Ayakulik River. The spawning grounds closures were adopted in both the Karluk and Ayakulik rivers. Neither of the gear limitation proposals was accepted.

Current Issues

The Board of Fisheries has spent considerable time dealing with the issue of annual limits for chinook salmon in the Kodiak area. This topic continues to be an issue. For a complete discussion on the issue of annual limits please refer to the saltwater chinook chapter, in the section on recent Board of Fisheries actions.

Another major issue in these fisheries is public access. Much of Karluk Lake, the banks along the river, and much of Karluk Lagoon are owned by two Native Corporations. A very small percentage of the drainage is owned by private individuals, contains public easements, or consists of small tracts purchased by the State of Alaska. This land ownership pattern has lead to confusion among anglers wishing to use these lands and avoid trespassing. The Alaska Department of Natural Resources, in cooperation with the Alaska Department of Fish and Game, published a brochure in 1997 titled: Karluk River, Access and Use Information. This brochure showed the location of private land and public easements. It was designed to clearly delineate land ownership so that people could plan trips, contact appropriate land owners, and avoid trespass.

Most of the land in the Ayakulik drainage is in the Kodiak National Wildlife Refuge; however, the land around the lagoon and ocean beach is primarily owned by a Native Corporation and private individuals. There are also public easements in this area.

Access to fishing along the Karluk and Ayakulik rivers will remain an important issue as native corporations develop land use strategies. There is a possibility that land along the Karluk will be purchased and made part of the Kodiak National Wildlife Refuge. If this happens, the land use strategies used by the USF&WS will affect angler access as well.

Ongoing Research and Management Activities

Setting escapement objectives at effective levels ensures that the resource is conserved and fishing opportunity for the public is maximized. It appears that the current escapement goals (Karluk 4,500-8,000, Ayakulik 6,500-10,000) are working well, as escapement within these ranges has generated large returns. Beginning in June 1993, a major research project was initiated on the Karluk and Ayakulik rivers to collect age, size, and sex information from the escapement and harvest. These data will be used to construct brood tables which will be used to refine escapement objectives. The project also monitors and documents the recreational harvest and effort. Complete results of the work conducted in 1993 through 1996 are presented in Schwarz (1996) and Motis (1997). Data collected in 1997 and 1998 have not been finalized and presented in a Fisheries Data Series report yet, but should be available in 2000 (Clapsadl *In prep*).

Recommended Research and Management Activities

Age, length and sex data should continue to be sampled from inriver returns at the Karluk and Ayakulik weirs. These data will allow brood tables to be constructed so that escapement goals can be refined.

Angler effort and catch information from anglers passing through the weirs should continue to be collected and used as an inseason indicator of angler success.

A brochure on access and use for the Ayakulik River, similar to the brochure printed for the Karluk River, should be developed before the 1999 fishing season.

Inseason Management Approach

The Karluk and Ayakulik rivers will be managed so that minimum escapement levels are met (Karluk 4,500, Ayakulik 6,500). Time of entry data have been compiled so that it is possible to project how many fish should be through the weir on any specific date in order to achieve a minimum escapement objective. In order to achieve minimum spawning escapements, weir counts must total the minimum spawning objective plus the recent 3-year average recreational harvest so that after the sport fishing removal occurs, a minimum spawning escapement will still be present.

The final weir count on the Karluk River should total 6,000 chinook (4,500 minimum spawning goal + 1,200 sport fish harvest above weir + 300 hooking mortality), an average of 50.3% of the weir count has been made by June 17. In order to achieve the minimum spawning objective a weir count of 3,000 (6,000 x .503) should be obtained by June 17.

On the Ayakulik River the final weir count should total 7,600 (6,500 minimum spawning objective + 900 sport fish removal above the weir + 200 hooking mortality). Similar to the Karluk River, the time of entry data on the Ayakulik River indicate that an average of 49.7% of

the weir count has occurred by June 13. Therefore, to achieve a minimum spawning escapement, a weir count of approximately 3,780 chinook salmon should have occurred by June 13.

If either weir count is below the desired mid-point, the sport fishery will be restricted so that minimum objectives can be reached. Restrictions may be imposed earlier than the mid-point of the run if it becomes apparent that the run is below average, and restrictions will be necessary to achieve minimum objectives. Restrictions may include reductions in bag limits, elimination of daily catch-and-release fishing, or complete closures. The restriction chosen will be the one that impacts the fishery the least but still allows the minimum escapement objective to be achieved.

KARLUK RIVER SOCKEYE SALMON FISHERY

Historical Perspective

Sockeye salmon return to the Karluk River from June through September. Sockeye salmon in the Karluk River drainage spawn from August through November, with about one-third spawning in Karluk Lake and the remaining population spawning in the lake's tributaries. Sockeye salmon bound for the Karluk river are harvested in commercial, subsistence, and sport fisheries.

Daily bag and possession limits for salmon, other than chinook, in the remote portions of the Kodiak Regulatory Area are 5 per day, 10 in possession with no size limits. All fisheries for sockeye salmon are open year-round.

From 1988 through 1997, sport anglers harvested an average of 1,510 sockeye salmon from Karluk drainage waters (Table 36). This harvest has accounted for an average of 16% of the total KMA sockeye salmon harvest over this period (Table 36). Both Karluk Lake and Karluk River (and its tributaries) support sport fisheries for sockeye salmon. Sport harvests are generally small in relation to escapement, which averaged 750,000 sockeye salmon over the past 10 years.

Recent Fishery Performance

The sport harvest of sockeye salmon from Karluk drainage waters during 1997 (1,200) was slightly below the 1988-1996 average (Table 36). This harvest accounted for 15% of the total sockeye salmon harvest from KMA waters during 1997. The sockeye harvest in the Ayakulik was 860 in 1997 and represented 9% of the KMA total harvest. Anglers released 83% of their catch in the Karluk and 77% of their catch in the Ayakulik. Statewide Harvest Survey estimates of sport harvest or catch are not available for this fishery for 1998 at this time.

Recent Board of Fisheries Actions

The Alaska Board of Fisheries adopted a public proposal at its December 1995 meeting that allows anglers in the remote area to have 2 daily bag limits of salmon other than chinook in their possession. In the past, anglers were limited to 5 salmon other than chinook in their possession. Beginning in 1996, anglers were allowed 10 in their possession.

Current Issues

As private native owners and the Kodiak National Wildlife Refuge develop their respective land management strategies, maintaining adequate angler access to the Karluk River fishery will become necessary if this fishery is to exhibit continued growth.

Ongoing Research and Management Activities

There are no specific research or management activities directed at this fishery at present.

Recommended Research and Management Activities

No specific research or management activities are recommended for this fishery at present.

Table 36.-Sport harvest of sockeye salmon from Karluk and Ayakulik rivers drainages, 1988-1997.

	KMA	Karluk River			Ayakulik River		
Year	Harvest	Harvest	Released	% of KMA	Harvest	Released	% of KMA
1988	8,853	1,256		14			
1989	13,173	899		7			
1990	8,224	1,292		16			
1991	6,906	894		18	179	4,077	4
1992	8,408	798	4,634	13	633	4,389	10
1993	10,507	1,572 [a]	7,015	15	985 [b]	4,854	9
1994	13,502	3,627 [c]	4,678	27	1,223 [d]	1,754	9
1995	9,333	2,133	3,091	23	413	338	4
1996	11,727	1,417	3,572	12	824	1622	7
1997	9,907	1,195	5,986	12	857	2826	9
Average	10,054	1,508	4,829	16	731	2,837	7

[a] An ADF&G creel census documented a harvest of 337 and release of 460 sockeye salmon on the Karluk River from June 1 through July 10 (Schwarz 1996a). The portage exit location was not covered in 1993.

[b] A USF&WS creel census documented a harvest of 322 and release of 595 sockeye salmon on the Ayakulik River from June 1 through July 10 (Schwarz 1996a).

[c] An ADF&G creel census documented a harvest of 127 and release of 687 sockeye salmon on the Karluk River from June 1 through July 10 (Schwarz 1996a). These figures do not include catches made below the weir.

[d] A USF&WS creel census documented a harvest of 558 and release of 1,204 sockeye salmon on the Ayakulik River from June 1 through July 10 (Schwarz 1996a).

NORTH KODIAK ISLAND ARCHIPELAGO MARINE BOTTOMFISH FISHERIES (HALIBUT, ROCKFISH AND LINGCOD)

HISTORICAL PERSPECTIVE

The marine waters of the Kodiak road zone and the Afognak/Shuyak/Barren islands support a multitude of marine fish stocks. Of these stocks, halibut and rockfish are the most commonly targeted by recreational anglers. Salmon also represent a large portion of the marine catch. The majority of the halibut and rockfish are harvested from late April through early September. The daily bag and possession limits for halibut are 2 and 4, respectively. Bag and possession limits for rockfish and lingcod became effective in the spring of 1993. The bag and possession limits for rockfish are 10 and 20, respectively, and for lingcod 2 and 4. A season was also established for lingcod, from July 1 through December 31.

From 1988 through 1997 anglers expended an average of about 52,000 angler-days fishing in salt water (Tables 2 and 3). Saltwater effort is estimated as well as the saltwater catch for salmon and bottomfish through the Statewide Harvest Survey. However, it is not possible to estimate the saltwater effort directed at salmon versus marine bottomfish from the Statewide Harvest Survey. Based on species composition of the catch, half of the saltwater effort is probably directed at bottomfish, if the amount of catch is reflective of the amount of effort. About 75% of the bottomfish effort is expended fishing for halibut with the remaining effort being directed towards rockfish (20%) and lingcod (5%) (Vincent-Lang 1995). In general, effort has been relatively stable over this period.

Since 1988, Kodiak road system and Afognak/Shuyak/Barren Island marine waters have supported 71% of the total harvest of halibut and 74% of the historical harvest of rockfish from KMA waters (Table 37). From 1988 through 1997, sport anglers harvested an average of 5,840 halibut and 4,020 rockfish from Kodiak Road System marine fisheries (Table 37). This harvest accounted for an average of 41% and 55% of the total KMA halibut and rockfish harvest, respectively, over this period. Over this same period, the marine waters in proximity to the Afognak/Shuyak/Barren Island group supported sport harvests of 4,120 halibut and 1,440 rockfish (Table 37). These harvests represented 30% of the total harvest of halibut and 19% of the rockfish harvest from KMA waters.

Although not a commonly targeted species, lingcod are also harvested in the KMA. The average harvest in the management area is 1,400 fish. The Kodiak road zone accounts for an average of 45% of the harvest, while the Afognak islands accounted for 18%.

Bottomfish sport fisheries are managed by sport fish staff from the Anchorage and Homer offices. They have compiled a management report that contains additional information regarding these fisheries (Vincent-Lang 1998).

RECENT FISHERY PERFORMANCE

Fishing effort in marine waters in 1997 totaled 45,040 angler-days in the Kodiak Regulatory area and 9,830 in the Alaska Peninsula/Aleutian Island Regulatory areas (Table 1). The amount of fishing effort directed at bottomfish can be approximated by assuming that because 51% of the marine catch was bottomfish, 51% of the marine fishing effort was targeted at bottomfish. The

Table 37.-Sport harvest of halibut, rockfish, and lingcod from Kodiak road zone and Afognak/Shuyak/Barren Island waters of the Kodiak Management Area, 1988-1997.

	KMA	Kodiak Road Zone		Afognak/Shuyak/Barren Is.	
Year	Harvest	Harvest	% of KMA	Harvest	% of KMA
HALIBUT					
1988	9,697	3,600	47	3,512	45
1989	11,847	4,663	45	4,449	43
1990	11,679	4,845	42	3,630	31
1991	17,309	6,004	50	3,878	32
1992	13,505	5,071	38	4,178	31
1993	17,660	6,385	36	5,135	29
1994	17,312	6,074	35	5,039	29
1995	16,785	6,296	38	5,072	30
1996	17,982	6,671	37	2,715	15
1997	21,004	8,774	42	3,597	17
Average	15,478	5,838	41	4,121	30
ROCKFISH					
1988	13,244	5,930	45	4,220	32
1989	5,325	2,637	50	1,505	28
1990	6,519	3,251	50	367	6
1991	9,259	5,882	72	1,502	18
1992	6,566	4,316	66	982	15
1993	8,358	5,340	64	781	9
1994	5,743	2,953	51	1,109	19
1995	4,806	2,729	57	806	17
1996	6,741	3,320	49	933	14
1997	7,659	3,841	50	2,168	28
Average	7,422	4,020	55	1,437	19
LINGCOD					
1991	2,345	729	31	259	11
1992	1,753	709	40	484	28
1993	1,120	324	29	198	18
1994	1,199	510	43	273	23
1995	1,007	579	57	167	17
1996	832	566	68	91	11
1997	1,524	724	48	297	19
Average	1,397	592	45	253	18

Note: Estimates from the Statewide Harvest Survey (Mills 1989-1994, Howe et al. 1995-1998).

approximate fishing effort for bottomfish in the KMA in 1997 was 27,980 angler-days (45,040 + 9,830 x 0.51).

The sport harvest of halibut from Kodiak road zone marine fisheries during 1997 (8,770) was the highest on record (Table 37). The 1997 rockfish harvest (3,840) was average. These harvests accounted for 42% and 50% of the total halibut and rockfish harvests, respectively, from KMA waters during 1997.

The sport harvest of halibut from Afognak/Shuyak/Barren Island marine fisheries during 1997 was 3,600. The sport harvest of rockfish during 1997 was 2,170 (Table 37). These harvests accounted for 17% and 28% of the total halibut and rockfish harvests, respectively, from KMA waters during 1997.

Effort and harvest estimates for marine bottomfish are not yet available for the 1998 season.

RECENT BOARD OF FISHERIES ACTIONS

The Board of Fisheries adopted regulations affecting rockfish and lingcod fisheries that became effective on Kodiak in June of 1993, halfway through the 1993 fishing season. Rockfish bag and possession limits were established at 10 and 20 fish, respectively, and lingcod limits were established at 2 and 4, respectively. A fishing season of July 1 through December 31 was established for lingcod to protect fish during spawning and nest guarding. Finally, a regulation was adopted where lingcod can only be landed by hand or with a landing net. Similar regulations were adopted for the Alaska Peninsula/Aleutian Islands Regulatory area and went into effect for the 1995 fishing season.

At the February 1998 Statewide Board of Fisheries meeting, a regulation was adopted giving the Department of Fish and Game the authority to require guides to record the catch and effort of their clients in log books. During the 1998 fishing season the Department required saltwater charter boat operators to record effort and catch data in log books.

During the 1999 Board of Fisheries meeting in Kodiak, this issue of lingcod landing requirements was discussed. The landing restriction, which required lingcod be landed by hand or with a net, was implemented to reduce mortality from undersized lingcod or lingcod caught during the closed season from being gaffed and then released. In 1993 the Board adopted the lingcod closed season but never adopted a size limit. Because the Board did not adopt a size restriction the landing restrictions, make sense during the closed season but not during the open season. At its 1999 meeting, the Board remedied this situation by making it illegal to gaff a fish that an angler intended to release. The regulation is stated in the positive, requiring a person to keep any lingcod that they gaff.

CURRENT ISSUES

The North Pacific Fisheries Management Council (Council) has management jurisdiction over the management of halibut stocks in the United States. The Council established a Guideline Harvest Level (GHL) for the sport charter fishery in September 1997. The allocation was stated as a fixed proportion of a floating Total Allowable Catch (TAC). Management measures to facilitate implementation were not adopted at that time. The Secretary of Commerce has not yet signed the GHL into regulation, in fact, the Secretary sent the GHL back to the Council asking for further definition on how the GHL would be implemented. The Council appointed a stakeholder committee to suggest strategies for the implementation of the GHL. This committee

has met, and a report of their efforts and a summary of other comments will be presented to the Council in February 1999. In addition to implementation strategies, the report will also include an alternative, suggested by the State of Alaska, on the GHL itself. The state's alternative proposes a fixed allocation, stated as a range. The Council will likely accept the report and put the options including the state's alternative out for analysis.

Upon a request from the Council, the Alaska Board of Fisheries put out a call for proposals for the development of the Local Area Management Plans (LAMPs) for halibut fisheries. The Board has received proposals from Kodiak, Lower Cook Inlet, and upper Cook Inlet, which are the areas scheduled for discussion in the 1999 cycle. Communities in Prince William Sound and Southeast Alaska are also discussing LAMPs. The three issues highlighted to date are clarification of the GHL concept adopted by the Council, defining the geography for LAMPs, and a debate on the need for a moratorium.

Until the Council clarifies the GHL and provides a list of tools to be used to implement the GHL, a clear foundation for development of LAMPs will not exist. Work on LAMPs has begun but many issues will remain unresolved until the GHL is clarified.

ONGOING RESEARCH AND MANAGEMENT ACTIVITIES

The sport harvest of groundfish is sampled annually at the primary boat harbors in Kodiak. Data collected from various species of rockfish, lingcod, and halibut include length, weight, age, sex, gonad condition, and location of capture. These data are monitored for broad trends in species, age, and size composition that may be indicative of overharvest.

It is hoped that abundance and sustained yield can be estimated once a sufficient time series of data is available. Halibut age and size data are summarized by the department and forwarded to the International Pacific Halibut Commission for incorporation into their stock assessment models.

RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Staff recommends continuation of the current research program. Staff should provide support to the local advisory committees as they develop LAMPs.

CHINIAK BAY CHINOOK SALMON

HISTORICAL PERSPECTIVE

Kodiak Island waters are a feeding area for chinook salmon as they grow and mature at sea. These chinook have been harvested in small numbers in the past, often incidentally when anglers are fishing for halibut or rockfish (Table 38). Saltwater harvest of chinook salmon in the Kodiak Regulatory Area averaged 125 fish from 1977 through 1991. In 1992 anglers began to target on these chinook salmon by trolling. Although harvests occur throughout the marine waters of Kodiak, harvest and effort have concentrated in Chiniak Bay, directly adjacent to the town of Kodiak. The Chiniak Bay harvest estimate for the 1992 season was 350 chinook salmon. In 1993 the Statewide Harvest Survey estimated the Chiniak Bay chinook harvest at 1,720 fish. The large harvest in 1993 was due to the high abundance of chinook salmon in the area and was also reflected in the incidental commercial harvests in Kodiak and in Cook Inlet chinook salmon harvests. The success experienced in 1993 encouraged anglers, and the fishery continued to

Table 38.-Sport harvest of chinook salmon from the marine waters of Kodiak Island and Mill Bay, 1977-1997.

	Harvest			
Year	Total Saltwater	Chiniak Bay	Mill Bay [a]	Other Kodiak Saltwater
1977	34			34
1978	12			12
1979	98			98
1980	60			60
1981	194			194
1982	167			167
1983	198			198
1984	210			210
1985	162			162
1986	168			168
1987	54	18		36
1988	145	73		72
1989	120	84		36
1990	66	44		22
1991	198	188		10
1992	585	346	117	122
1993	2,454	1,720	47	687
1994	668	408	48	212
1995	1,138	786	0	352
1996	1,410	1,107	0	303
1997	2,722	1,838	0	884

[a] The chinook salmon harvested in Mill Bay were produced by a department stocking project which occurred from 1989-1994.

develop in terms of angler effort and harvest. Island-wide saltwater sport harvest of chinook salmon dropped significantly in 1994, probably due to a decrease in abundance of chinook salmon. The harvest has increased annually since 1994. Record harvests occurred in 1997 with 1,840 chinook salmon harvested in Chiniak Bay and 880 chinook salmon harvested in the remaining salt water of the Kodiak Regulatory Area.

RECENT FISHERY PERFORMANCE

During the 1998 Kodiak harbor chinook tag recovery program, 313 chinook salmon were examined for the tags, and many anglers were informally interviewed. Based on these informal interviews, the 1998 harvest of chinook salmon is expected to be similar to the 1997 record harvest. Chinook salmon fishing was good from June through mid July. In late July and August the abundance of coho increased in Chiniak Bay to the point where it was difficult to catch chinook salmon. From July 19 through August 31, dock-side samplers observed only 78 chinook salmon but counted 990 coho salmon incidentally to their chinook sampling. Fishing for chinook salmon was also good in late September through November. Fishing effort drops off in the fall because inclement weather hinders fishing. Summer tourism also comes to an end and charter boat fishing activity slows.

For the first time in 1998 charter boat operators were required to document their fishing activity in log books. The charter boat chinook salmon harvest in 1998 for Chiniak Bay was 1,007 (Table 39). The charter boat harvest of chinook salmon in the remaining salt water of the Kodiak Regulatory Area was 249. It should be noted that these harvest figures do not include the chinook salmon harvest for anglers fishing from private boats. A complete estimate of the 1998 chinook salmon harvest will be made by the Statewide Harvest Survey and will be available in the summer of 1999.

Table 39.-Saltwater charter boat effort and chinook salmon harvest for 1998.

Number of Charter Boats Operating		Number of Client-Trips	Number of Chinook Harvested		
			Chiniak	Other	Total Saltwater
76 [a]	Residents	1,037	254	44	298
	Non-residents	4,236	718	192	910
	Residency Unknown	55	35	13	48
	Total	5,328	1,007	249	1,256

Source: Data summary from 1998 Saltwater Sport fishing Charter Vessel Logbook files as of 28 December 1998.

[a] This includes all boats, not just those targeting chinook salmon.

RECENT BOARD OF FISHERIES ACTIONS

The Alaska Board of Fisheries made a special call for proposals with a deadline of April 10, 1997. Proposals were to address seasonal non-commercial harvest limits for nonresident fishers. Over the years, the Board had received numerous proposals to establish export limits for nonresident fishers. The Board heard reports from ADF&G, Department of Law, and Fish and Wildlife Protection that enforcement in the field and defending export limits in court would be very difficult. The most manageable and defensible regulations would be seasonal harvest limits for nonresident anglers. Proposals were to be considered at the February 4, 1998 Statewide Finfish regulation meeting in Anchorage.

Proposal 313, submitted at the February 1998 meeting, proposed annual limits for chinook, coho, and sockeye salmon for both resident and nonresident anglers. The proposal was very controversial and received much attention from the Kodiak community. The local advisory committee appointed a 10-member study group to consider the issue and see if they could reach a consensus on a recommended action. The study group met three times and reviewed the issue. Twenty pages of minutes were taken during these meeting and were presented at the February 4, 1998 Board of Fisheries meeting as Record Control (RC) #22. The study group reached a consensus that an annual limit for the Kodiak Area of 6 chinook salmon for nonresident anglers should be recommended as a regulation to the Board of Fisheries. This recommendation was amended by the Kodiak Advisory Committee to include a limit of 15 coho salmon for nonresident anglers, and was then forwarded to the Board of Fisheries.

The Board of Fisheries appointed a study group at their February 4, 1998 statewide meeting in Anchorage to discuss and provide recommendations on proposal 313. The minutes and recommendations of the subcommittee were presented into the Board record as RC #75. The Board struggled with the question of whether to bring the issue up at the statewide meeting or to wait 11 months when the Board was scheduled to meet in Kodiak. A Kodiak meeting would provide a better opportunity for participation by the users in Kodiak, and there was no conservation problem pressing for urgent action. However, the Board decided to act at the statewide meeting in order to prevent attracting excessive effort to Kodiak because it would have been the only area without a seasonal limit. If, after a year, people were dissatisfied with annual limits they could bring it up when the Board met in Kodiak in January 1999. The Board adopted substitute language for proposal #313, which established an annual chinook salmon limit of 5 fish for both residents and nonresidents.

At the February 1998 meeting, the Board also adopted a regulation allowing the department to require guides to record the effort and harvest of their clients.

The Board's decision to apply the annual chinook salmon limit to both residents and nonresidents was not well received in the community of Kodiak and, as a result, a committee of the Board agreed to hold a public hearing in Kodiak on April 9, 1998. At the public hearing the Board heard stock status reports for the Kodiak chinook sport fishery. The general consensus was that the community had spent a great deal of time on this issue through the advisory committee process and supported the recommendation of the advisory committee to apply annual limits to nonresidents only.

The 10-member study group that was originally appointed by the Kodiak Advisory committee to study proposal #313 and forwarded a recommendation to establish an annual limit of 6 chinook

for nonresidents only, petitioned the Board to rescind the action it took in February 1998. The study group maintained that pursuant to 5 AAC 96.625 (f) there was a "…biologically allowable resource harvest which would be precluded by delayed regulatory action and such delay would be significantly burdensome to the petitioners because the resource would be unavailable in the future." The petitioners asked the Board to adopt the amended proposal 313 as submitted by the Kodiak Advisory Committee. The Board of Fisheries responded to this petition by re-considering the Kodiak Area chinook salmon sport fishery on May 9, 1998. In deliberations the Board found Kodiak chinook salmon stocks to be at historically high levels, with sport fish harvest fairly small and stable. They also found that if the annual limit was removed immediately before the June freshwater fishery, it was unlikely a large influx of nonresident effort would occur during the June fishery. Considering this, the Board found that a regulation causing anglers to forgo a biologically available harvest was not necessary and was burdensome. An emergency regulation was adopted which removed the chinook salmon annual limit for all anglers.

The Board directed a committee be formed that would investigate under what conditions nonresident anglers could be regulated differently than resident anglers. The committee consists of members from the Kodiak advisory committee, Board of Fisheries, Sport Fish Division, and Department of Law. The committee met on October 8, 1998 and on December 2, 1998. The committee brought its finding and recommendation back to the Board when it met in Kodiak on January 15, 1999.

At the January 1999 meeting in Kodiak the Board considered Proposal 73, which proposed to establish an annual limit of 6 chinook per year for nonresident anglers in Kodiak. The Board tabled proposal 73 in favor of forming a Northern Gulf of Alaska Chinook Salmon Task Force. The task force will be appointed and charged at the October 1999 Board of Fisheries work session. The task force is supposed to take a comprehensive look at chinook salmon gulf-wide.

MANAGEMENT OBJECTIVES

No management objectives have been established for the Kodiak saltwater chinook sport fishery. The fishery targets mixed stocks of unknown origin, although it is known from coded wire tag recoveries that hatchery stocks originating in Washington, British Columbia, and Southeast Alaska are present in the fishery (Table 40). The Board of Fisheries addressed a proposal to establish annual chinook limits for the Homer winter saltwater chinook sport fishery at its November 1998 meeting in Homer. The Board tabled taking action in the Homer fishery and decided to appoint a task force at its October 1999 work session with the charge of developing a comprehensive approach to management of saltwater chinook salmon fisheries in the entire North Gulf. This review would include Cook Inlet, Homer, Kodiak, and Seward. The Homer winter saltwater chinook sport fishery is similar to the Kodiak fishery because both fisheries target mixed stocks of unknown origin and the harvest is about the same magnitude.

Harvests of chinook salmon, particularly in marine waters, have received increasing attention throughout the Pacific northwest. Management of chinook salmon is difficult because of the highly migratory nature of the species. Chinook salmon are often harvested far beyond the political boundaries encompassing their natal streams, resulting in the conflicts frequently

Table 40.-Chiniak Bay chinook salmon coded wire tag recoveries, 1994-1998.

Year	Number of Chinook Sampled	Number of Tags Recovered	Place of origin
1994	112	1	B.C. Masset
		1	B.C. Kitimat
		1	B.C. Snootli
1995	201	1	AK Sitka (Medvejie)
1996	134	0	
1997	183	1	B.C. Terrace
		1	B.C. Tahsis (Voluntary Return) [a]
1998	295	1	B.C. Robertson Cr.
		1	B.C. Snootli
		1	B.C. Terrace
		1	B.C. Shuswap
		1	WA Turtle Rock
		1	WA Quinault
		2	B.C. Tofino (Voluntary Return) [a]

[a] Voluntary tag returns occur when anglers turn in tagged heads. Other tag recoveries occur during department sampling projects.

documented in the fisheries literature and news media. Conflicts concerning implementation of the Endangered Species Act (ESA), U.S.-Canada treaty negotiations, and allocations between competing users are some of the major issues that are developing regarding this fishery.

ONGOING RESEARCH AND MANAGEMENT ACTIVITIES

Systematic sampling of the sport harvest of troll-caught chinook salmon for biological data and coded wire tags began in 1994 (Table 40). During 1998, from June 11 through August 30, 295 chinook salmon were examined for the presence of coded wire tags. Results are listed in Table 41. Since the 1997 sampling results have not been included in an Annual Management Report, a summary of 1997 sampling is presented in Table 42. The sport harvest from charter and private vessels was sampled when the boats returned to harbor. In addition, marked department totes

Table 41.-The number of chinook salmon examined for the presence of coded wire tags by department personnel, and the number of coho salmon observed during 1998, by week.

Date	Chinook Observed	Adipose Clips	CWT Recovered	Coho Observed
June 11-14	10	0	0	
June 15-21	5	0	0	
June 22-28	34	1	1	
June 29-July 5	77	1	1	
July 6-12	70	2	2	
July 13-19	39	4	2	9
July 20-26	18	0	0	232
July 27-Aug. 2	17	0	0	143
Aug. 3-9	17	0	0	182
Aug. 10-16	4	0	0	78
Aug. 17-23	4	0	0	176
Aug. 24-30	0	0	0	150
Total	295	8	6	970

were left at the harbor for collection of sport caught halibut, rockfish, lingcod and salmon carcasses. Chinook carcasses left in these totes where checked for the presence of coded wire tags. Six tag recoveries were made during 1998 sampling efforts. Four of the tags were released from hatcheries in British Columbia and two were released from hatcheries in Washington. In addition to the six tags found while sampling the fishery, two tags recovered in the sport fishery were voluntarily turned in. These tags were released from British Columbia.

The dominant age class in this fishery has been age-1.3 chinook which accounted for over 75% and 51% of the samples in 1994 and 1995, respectively. The second most abundant age class is 1.2, which accounted for 18% and 26% of the samples in 1994 and 1995, respectively. Scales were collected in 1997 and 1998 but have not been processed to date.

Beginning in 1998 the Department of Fish and Game required charter boat vessels operating in salt water to record the catch and effort of their clients in log books. A summary of this information is provided in Table 39.

Table 42.-Chinook salmon examined for the presence of coded wire tags by department personnel by week, 1997.

Date	Chinook Observed	Adipose Clips	CWT Recovered
June 15-21	22	0	0
June 22-28	0	0	0
June 29-July 5	13	0	0
July 6-12	12	0	0
July 13-19	0	0	0
July 20-26	27	0	0
July 27-Aug. 2	37	0	0
Aug. 3-9	36	0	0
Aug. 10-16	11	0	0
Aug. 17-23	23	0	0
Aug. 24-30	0	0	0
Aug. 31-Sept. 6	0	0	0
Sept. 7- Sept.13	2	1	1
2-Oct	0	1	1
Total	183	2	2

OUTLOOK

The Kodiak saltwater chinook harvest in 1998 is expected to be similar to the 1997 harvest. The harvest during the 1999 season is difficult to forecast and will depend on many factors including: the abundance of chinook in Kodiak Area waters, the amount of sport fishing effort, and the abundance of other salmon species.

RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

During the 1998 season Fish and Wildlife Protection conducted three undercover operations aboard Kodiak charter boats in order to verify the accuracy of the information recorded in log books, as well as to check for other violations. The results of this operation are presented in Table 43. Actual number of clients guided was 15 and agreed with the reported number. The actual halibut harvest was 26 with a reported harvest of 27. The coho harvest was 61 with 65 reported harvested. Two chinook were harvested with one reported. The accuracy of the log books from this limited sample appears to be good. It is recommended that this undercover work continue so that log book accuracy can be verified. Also more work should be done in June and July, when chinook harvests are expected to be higher.

Dockside sampling of the saltwater chinook harvest for coded wire tags should continue so that the Board will obtain more information on the stocks involved in this mixed-stock fishery. Age, size, and sex data should also continue to be collected.

Table 43.-Effort and harvest data recorded on Kodiak area charter boat logbook forms compared to actual effort and harvest observed by undercover Fish and Wildlife Protection agents, 1998.

Boat		Number of Clients	Chinook Salmon	Coho Salmon	Halibut
1	Observed	7		28	14
	Log Book Report	7		28	14
2	Observed	5	1	31	8
	Log Book Report	5	1	31	8
3	Observed	3	1	2	4
	Log Book Report	3	0	6	5
Total	Observed	15	2	61	26
	Log Book Report	15	1	65	27

UNALASKA SPORT FISHERIES

UNALASKA MARINE FISHERIES

Historical Perspective

Unalaska Island is located on the Aleutian Island chain (Figure 15). The island is remote, located over 790 air miles from Anchorage, and is reachable only by air or boat. Dutch Harbor and Unalaska are the island's major population centers. Despite its remoteness, Dutch Harbor is the largest fishing port in the Pacific. According to the Department of Community and Regional Affairs, the population of Dutch Harbor/Unalaska has increased from 1,908 to 4,285 from 1988 to 1998, or more than doubling over the past 10 years. In addition to these permanent residents, it is estimated that the town supports an additional population of between 6,000 and 10,000 seasonal residents. These people are mainly associated with the commercial fishing industry and either work in town for less than 6 months per year or spend the majority of their time offshore on vessels. A small road system serves the community of Dutch Harbor (Figure 16).

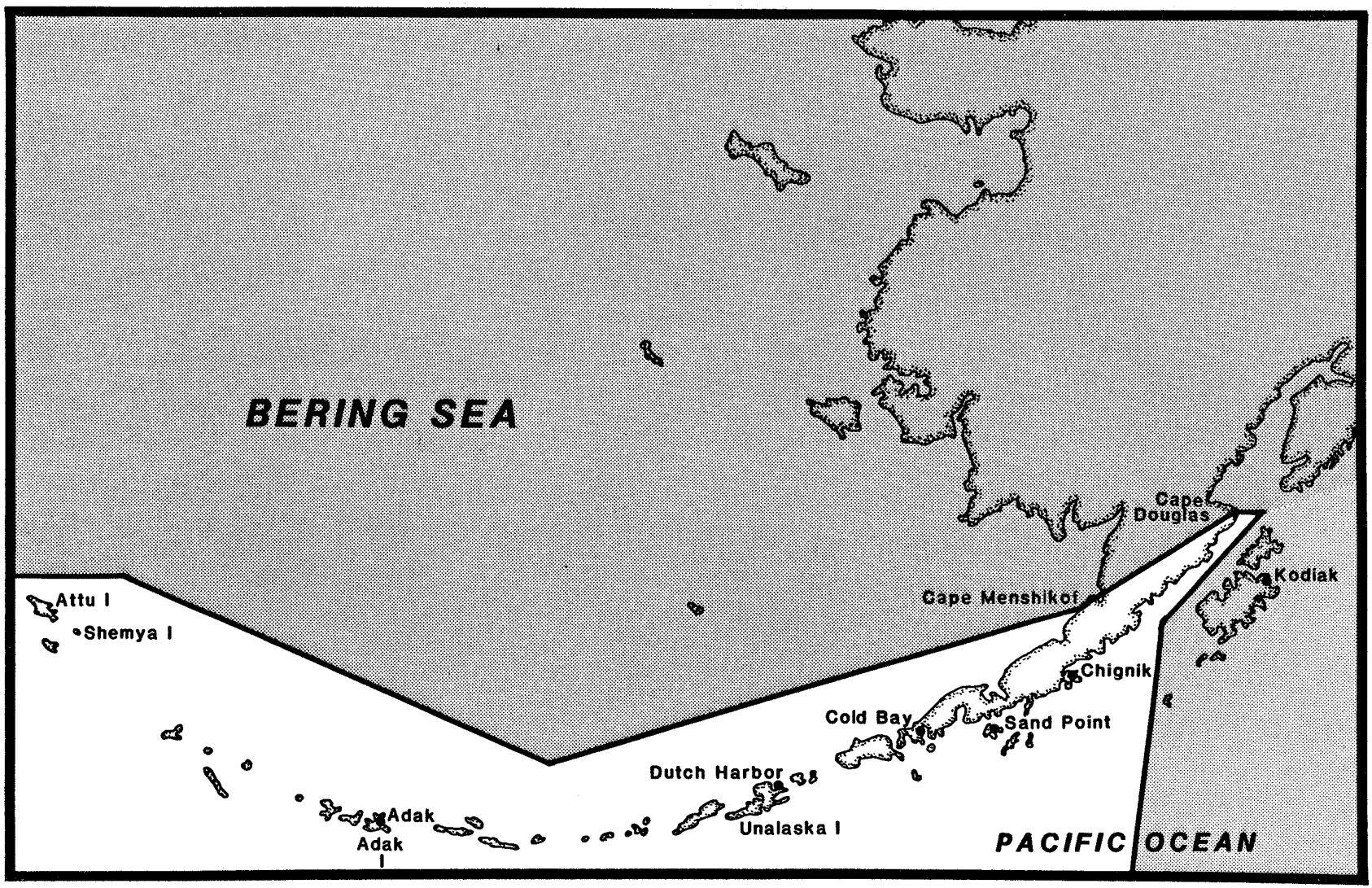

Figure 15.-Location of Unalaska Island, Aleutian Island chain.

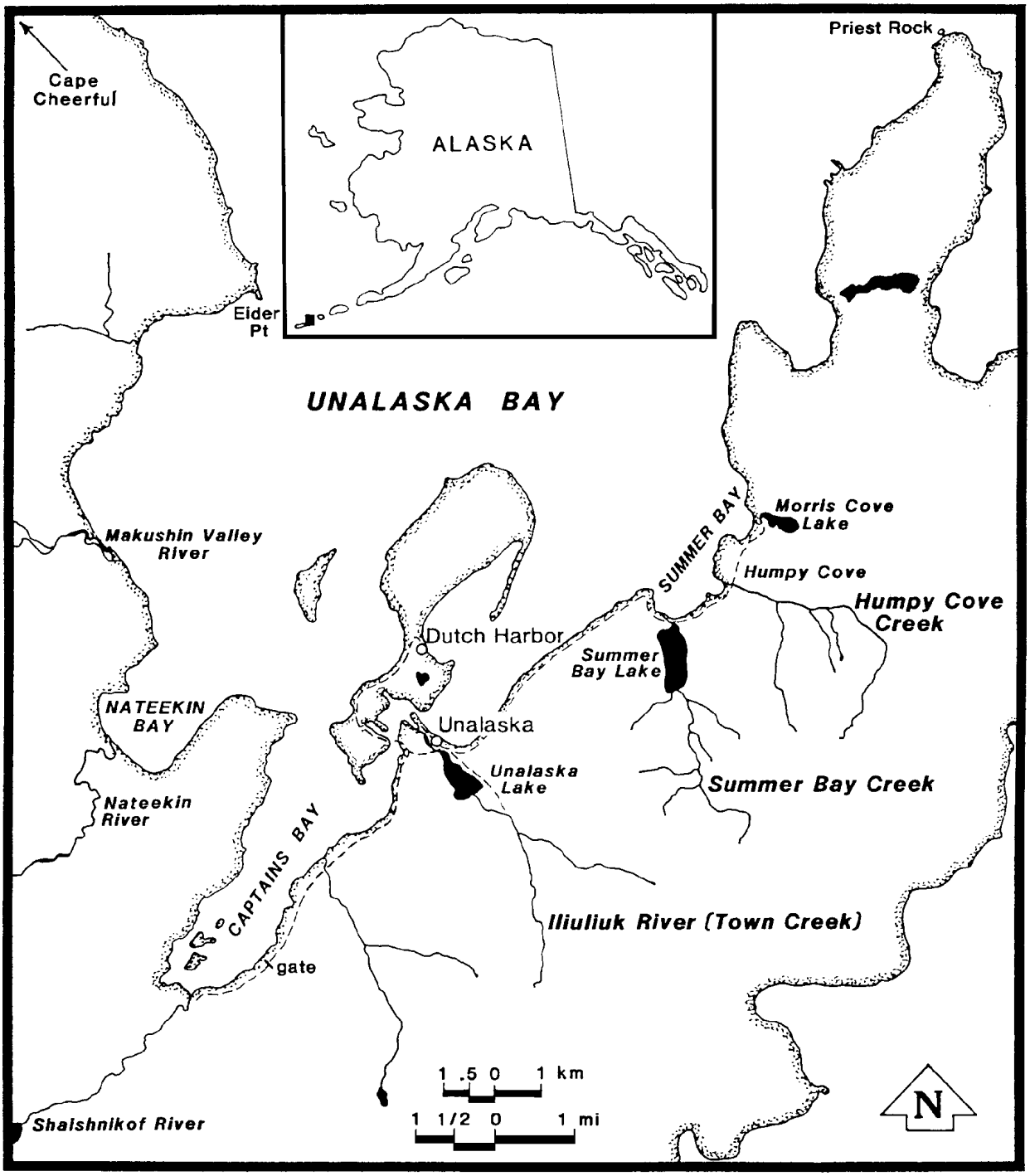

Figure 16.-Map of Unalaska road system.

Recent Fishery Performance

Fishing effort and catch are monitored in Unalaska through the Statewide Harvest Survey. Information is not published in the annual survey report unless more than 12 anglers respond to the questionnaire. Beginning in 1994, sufficient responses to the survey questionnaire were received so that effort and catch estimates could be generated for the marine fishery. Since an estimate was first generated in 1994 the marine angling effort has doubled from 2,060 angler-days to 4,620 angler-days in 1997 (Table 44). Harvest of halibut and rockfish have also more than doubled. The halibut harvest in 1997 was estimated at 1,910, with the rockfish harvest estimated at 340 fish. The Alaska state record for halibut was set in Unalaska Bay in 1996 when Jack Tragis landed a 459 pound halibut.

Recent Board of Fisheries Actions

The Board of Fisheries established bag and possession limits for rockfish and lingcod which became effective during the 1995 season. The bag limit was identical to the limits they established in Kodiak during 1994. The rockfish limits are 10 fish per day with 20 in possession. The lingcod daily bag limit is 2 fish per day and 4 in possession. A closed season was also established for lingcod from January 1 through June 30.

Ongoing Research and Management Activities

A requirement became effective for the first time during the 1998 season making it mandatory for charter boat operators to record effort and catch data in a log book. A total of five charter boats were active in Unalaska. The log book program is ongoing and will be another method to monitor the marine sport fishery in the area.

Recommended Research and Management Activities

Efforts should be made to ensure that all charter boat operators are aware of the registration and log book requirements.

Table 44.-Effort and harvest data for halibut and rockfish from the Unalaska boat and shoreline sport fishery, 1994-1997.

Year	Angler days	Halibut	Rockfish
1994	2,056	908	20
1995	2,225	1,334	205
1996	4,054	2,004	48
1997	4,622	1,912	337

Source: Howe et al. 1995-1998.

UNALASKA FRESHWATER SALMON FISHERIES

Historical Perspective

The drainages flowing into Unalaska Bay produce pink, chum, sockeye, and coho salmon. These species are harvested in commercial, subsistence, and sport fisheries. The commercial fishery targets pink salmon and occurs sporadically, depending on the strength of the return. Over the past 10 years, commercial salmon fisheries in Unalaska Bay have occurred during 2 years. During 1990 and 1994, when fisheries occurred, the harvest was 38,320 and 49,430 pink salmon, respectively (Table 45).

The subsistence fishery is managed by the Commercial Fisheries Division of the Alaska Department of Fish and Game. A permit and harvest record is required to participate in the fishery. Harvest is monitored by compiling data from returned permits. Over the past 10 years an average of 147 permits have been issued (Table 46). Harvests have averaged 7 chinook, 2,620 sockeye, 700 coho, 970 pink and 60 chum salmon. Information from returned permits indicates that approximately 80% of the sockeye harvest comes from Reese Bay, which is approximately 5 miles to the west of Unalaska Bay. In 1997 and 1998 over 80% of the coho harvest came in Nateekin River and Broad Bay, which are both located within Unalaska Bay. The Broad Bay harvest counted for 62% and 75% of the total coho harvest in 1997 and 1998, respectively.

The streams draining into Unalaska Bay produce relatively few salmon, with the exception of pink salmon on certain years. The freshwater fishery within Unalaska Bay is relatively small and as a result the Statewide Harvest Survey is not effective for monitoring effort and catch. Estimates are not published in the Statewide Harvest Survey unless at least 12 people respond to the survey questionnaire. Estimates which are based upon data collected from 12 to 30 respondents can only be used to indicate the general order of magnitude or tracking trends within the fishery. As the number of respondents increases, so does the accuracy of the estimate. For example, in 1997, 228 anglers responded to the survey questionnaire that they fished in Chiniak Bay. The resulting estimate was very reliable. In Unalaska Bay in 1997, 56 anglers responded to the survey questionnaire and gave information about their saltwater effort and catches, which produced a good estimate of effort and catch. However, in 1997 only 13 anglers returned the survey questionnaire stating that they had fished in Unalaska Bay streams. Because of the low response rate we do not have accurate estimates of the sport fishing effort or catch in streams draining into Unalaska Bay. In situations like these, onsite creel surveys are used to collect information and monitor fisheries. A creel survey was conducted in the Nateekin River in 1997 (Table 47).

Management Objectives

Escapement goals have been developed for several Unalaska Bay streams (Table 48). Managing the freshwater streams of Unalaska Bay presents a challenge because the fisheries resources are relatively small and the population and fishing effort are increasing. Unalaska is also very remote and there are not funds available to intensively monitor this small sport fishery. Management objectives are to allow fishing opportunity without overharvesting the small resource that is present. Stream surveys should be conducted after the fishery, in order to track trends in the fishery and ensure that the regulatory package is sufficient to protect the populations.

Table 45.-Unalaska Bay commercial salmon harvest in numbers of fish, 1989-1998.

Year	Chinook	Sockeye	Coho	Pink	Chum
1989	0	0	0	0	0
1990	0	81	3	38,323	188
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	41	0	49,428	138
1995	0	0	0	0	0
1996	0	0	0	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
Average	0	12	0	8,775	33

Source: Shaul and Dinnocenzo 1999.

Recent Board of Fisheries Actions

Because Unalaska Bay salmon production is relatively small and the population and sport fishing effort is expanding, the Board has adopted regulations to protect the resources. During the 1991 Board of Fisheries meeting, the bag and possession limits for salmon, other than chinook, in the marine waters of Unalaska Bay and its freshwater drainages were reduced to 5, of which only 2 could be coho salmon and 2 could be sockeye salmon. The Board also took action to close Humpy Cove Creek, Summers Cove Creek, and the portion of Unalaska Creek (also known as Iliuliuk or Town Creek) between the bridge at the outlet of Unalaska Lake and the Church Hole to sport fishing. These actions were taken to limit illegal fishing (primarily snagging) through closing areas that are very difficult to fish using legal methods due to the physical nature of the streams. In addition, flowing waters draining into Unalaska Lake were closed to fishing from August 1 through December 31.

Regulations were also adopted, which became effective during the 1998 season, that closed sockeye sport fishing in the Iliuliuk River. The sockeye closure was adopted to protect the depressed return of sockeye into Unalaska Lake. The Makushin and Nateekin rivers upstream from an ADF&G marker located about 2 miles upstream from the ocean were also closed to sport fishing. The upriver closures on the Makushin and Nateekin were adopted to provide a sanctuary for coho salmon, creating a pass-through fishery, where fish that reach the upper river are protected and allowed to spawn.

Table 46.-Estimated subsistence harvest for Unalaska Island, 1985-1998.

Year	Permits Issued	Chinook	Sockeye	Coho	Pink	Chum	Total
1985	65	0	897	208	1,293	20	2,418
1986	121	0	3,449	847	2,468	375	7,139
1987	81	0	1,097	378	1,780	151	3,406
1988	77	3	966	390	2,627	83	4,069
1989	74	2	1,112	470	1,292	36	2,912
1990	94	4	2,357	681	1,428	100	4,570
1991	89	0	1,294	666	1,075	45	3,080
1992	144	7	2,739	587	1,723	11	5,067
1993	139	17	2,831	697	587	136	4,268
1994	150	1	2,759	774	1,053	48	4,635
1995	160	23	4,484	484	791	23	5,805
1996	189	5	1,107	1,033	492	49	2,686
1997	221	8	4,192	864	554	110	5,728
1998	206	4	3,317	731	729	26	4,807
1989-98 Average	147	7	2,619	699	972	58	4,356

Note: Some of this harvest occurs outside of Unalaska Bay. In 1997, 94% of the sockeye salmon harvest came from Reese Bay; in 1998 86% came from Reese Bay, approximately 5 miles west of Unalaska Bay.

Table 47.-Nateekin River coho salmon creel census results, 1997.

Date	Total number of anglers	Total number of coho harvested	Total number of coho released
3-Sep	6	1	0
4-Sep	6	8	4
5-Sep	14	15	2
6-Sep	9	10	21
7-Sep	4	0	0
8-Sep	23	34	13
9-Sep	25	19	3
10-Sep	32	44	24
11-Sep	20	9	4
12-Sep	10	17	17
13-Sep	19	19	13
14-Sep	13	17	9
15-Sep	10	13	1
16-Sep	3	0	0
17-Sep	0	0	0
18-Sep	25	29	27
19-Sep	15	16	10
20-Sep	16	21	19
21-Sep	4	8	7
22-Sep	0	0	0
23-Sep	0	0	0
24-Sep	0	0	0
25-Sep	6	4	2
26-Sep	3	5	5
27-Sep	21	15	12
28-Sep	10	1	0
29-Sep	3	6	5
30-Sep	6	6	29
1-Oct	0	0	0
2-Oct	0	0	0
3-Oct	9	10	10
4-Oct	14	2	0
5-Oct	4	6	1
Total	330	335	238

Table 48.-Unalaska sockeye, pink and coho salmon minimum escapement goals as documented on peak surveys.

River	Sockeye	Pink		Coho[a]
		Odd Year	Even Year	(Average count)
Makushin		16,000	28,000	not surveyed
Nateekin		48,000	100,000	800
Shaishnikof		3,600	5,200	not surveyed
Unalaska Lake (Iliuliuk/Town)	500	4,800	6,800	80
Summers Bay	1,000	300	1,600	not surveyed
Humpy Cove		2,800	6,800	not surveyed
Morris Cove	250	200	800	not surveyed

[a] No escapement goal.

Current Issues

The vessel Kiroshima went aground in November 1997, directly in front of Summers Lake, and oil leaked from the vessel onto the beach and was carried into the lake by waves. The damage to the resources has not fully been accessed; but if future returns are reduced, care should be taken that sport harvest does not reduce returns even more than they have already been reduced. As a result of the oil spill, funding was secured to operate a weir. The results of weir project can not be released at this time due to legal proceedings with the State of Alaska and the owners of the Kiroshima. Tributary streams were surveyed on foot on October 26, November 22, and November 25 and only one coho was seen (Table 49). Department employees have observed coho in this tributary in past years, although no formal surveys were conducted. This situation will be considered and sport fish restrictions may be implemented so that coho stocks do not become depressed.

Ongoing Research and Management Activities

Local residents were concerned that the sport harvest of coho from the Nateekin River was damaging the coho population. The department conducted a creel census in 1997 and documented that 330 anglers harvested 335 coho. In addition to the harvest, 238 coho were released. Eighty-five percent of the anglers were local Unalaska residents. Thirteen percent of the anglers were not state residents (Table 47, Begich and Schwarz *In prep*).

A peak count of 576 coho was documented on a foot survey on October 8, 1997 (Table 50). During 1997 no commercial harvest occurred and subsistence harvests near the Nateekin were estimated to be 148 coho. Figures for 1997 show that the exploitation rate was approximately 45% (sport harvest + subsistence harvest/return (harvest + escapement)). A 45% exploitation rate of coho is well within the bounds of acceptable levels. It should also be noted that foot surveys do not count all the fish that are within the streams. Research done in Kodiak in 1997 and 1998 documented that foot counts of coho on the American and Olds rivers counted approximately 50% of the fish that were actually there. With this in mind, the spawning escapement in the Nateekin River with a 2 to 1 return per spawner could easily withstand a harvest similar to 1997 while maintaining sufficient spawning escapement to perpetuate abundant returns.

Beginning in 1998 the Sport Fish Division funded a Fish and Wildlife Technician position for 1 month. This person was available to walk streams and document escapement, put up sport fish regulation signage, and act as a representative of the Sport Fish Division in the community of Unalaska.

Inseason Management Approach

Since very little inseason information is available, management efforts consist of monitoring trends in escapement and making regulatory changes when necessary. This approach is exemplified with recent Board of Fisheries actions which reduced bag limits and closed areas to sport fishing.

Recommended Research and Management Activities

The department will continue to monitor stream escapements so that regulations can be adjusted to protect fishing opportunity and the resource. Funding a Fish and Wildlife Technician in Unalaska for at least 1 month a year is critical in accomplishing this objective. The feasibility of using stocking to enhance sport fishing opportunity in Unalaska should be examined.

Table 49.-Unalaska Bay salmon surveys, 1998.

Stream	Date	Sockeye	Coho	Pink	Chum	Comments
Wide Bay						
	6-Sep			1,450		
Makushin						
	11-Aug			300		good visibility
	11-Sep			370		fair visibility
	16-Sep [a]					too turbid
	27-Sep [a]					too turbid
	14-Oct [a]		211	100		147 coho above marker, 64 coho below marker, 39 pinks were morts
Nateekin						
	11-Aug			11,700		
	11-Sep			21,300		
	17-Oct [a]		254	1,283		All pinks morts, 137 coho above marker, 117 coho below marker
	12-Nov [a]		414			310 coho above marker, 104 coho below marker
Shaishnikof (Captains Bay)						
	11-Aug			500		
	11-Sep			3,200		
	3-Oct [a]		10			
Town Creek (Iliulik)						
	11-Aug	800		5,000		
	17-Aug [a]			491		
	7-Sep [a]	4		3,549		River foot survey (517 were morts)
	11-Sep	300		5,600		Did not survey above the lake
	21-Nov [a]		355			

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Table 49.-Page 2 of 2.

Stream	Date	Sockeye	Coho	Pink	Chum	Comments
Summers Bay						
	11-Aug			300		300 pinks at mouth
	6-Aug [a]	4				
	13-Aug [a]	2,334		418		Surveyed entire lake
	25-Aug [a]	191		2,050		
	26-Oct [a]	13	1			Surveyed lake tributary
	22-Nov [a]					Surveyed lake tributary
	25-Nov [a]					Lake tributary
Humpy Cove						
	11-Aug			1,600		400 pinks at mouth
	18-Aug [a]			5,091		
	4-Sep [a]			8,025		1,665 were above bridge
Morris Cove						
	10-Aug [a]					Nothing seen
	17-Aug [a]			7		

[a] Escapement figures documented on foot surveys, all others are aerial surveys.

Table 50.-Unalaska Bay drainage peak salmon escapement counts, 1990-1998.

	Pink Salmon		Coho Salmon		Chum Salmon		Sockeye Salmon	
Year	Number	Date	Number	Date	Number	Date	Number	Date
Nateekin River								
1990	46,100	19-Aug						
1991	25,500	15-Aug						
1992	22,000	07-Sep						
1993	63,000	13-Aug						
1994	13,570	14-Aug	1,421 [a]	16-Oct				
1995	2,500	22-Aug						
1996	34,000	01-Sep	455 [a]	07-Oct				
1997			576 [a]	08-Oct				
1998	21,300		414 [a]	12-Nov				
Makushin Valley Stream [b]								
1990	5,300	13-Sep						
1992	0	15-Aug						
1994	300	24-Aug						
1995	2	13-Aug						
1996	0	22-Aug						
1997	8,000	18-Aug						
1998	370	11-Sep	211 [a]	14-Oct				
Captain Bay Stream								
1990	10,000	19-Aug						
1991	1,200 [a]	30-Aug			26 [a]	30-Aug		
1992	2,350 [a]	08-Sep			37 [a]	08-Sep		
1994	5,400 [a]	19-Aug			8 [a]	19-Aug		
1995	2,793 [a]	03-Sep	1 [a]	03-Sep	45 [a]	03-Sep		
1996	1,506 [a]	21-Aug	103 [a]	13-Oct	79 [a]	21-Aug		
1997	3,600	18-Aug						
1998	3,200	11-Sep	10 [a]	03-Oct				
Iliuliuk								
1990	11,800	19-Aug						
1991	9,000	08-Sep						
1992	9,000	08-Sep						
1993	10,200	24-Aug						
1994	12,762 [a]	07-Sep					226 [a]	07-Sep
1995	9,752 [a]	29-Aug					255 [a]	13-Aug
1996	7,500 [a]	18-Aug					250 [a]	18-Aug
1997	12,300	01-Sep					330	18-Aug
1998	5,600	11-Sep	355 [a]	21-Nov			800	11-Aug

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	Pink Salmon		Coho Salmon		Chum Salmon		Sockeye Salmon	
Year	Number	Date	Number	Date	Number	Date	Number	Date
Summers Bay								
1990	3,000	11-Aug						
1992	200	15-Aug						
1994	4,300	28-Aug	50	28-Aug			178 [a]	19-Aug
1995	12	28-Aug	8	08-Sep				
1996	100	22-Aug	8 [a]	12-Oct			400	22-Aug
1997	126	19-Aug					800	18-Aug
1998	2,641 [D]	03-Oct	101 [D]	03-Oct			7,290 [D]	03-Oct
Humpy Cove								
1990	10,000	19-Aug						
1991	543 [a]	30-Aug						
1992	1,860 [a]	28-Aug						
1994	15,400	28-Aug						
1995	3,789 [a]	28-Aug						
1996	6,689 [a]	23-Aug						
1997	3,800	18-Aug						
1998	8,025 [a]	04-Sep						
Morris Cove								
1991							146 [a]	30-Aug
1994	28 [a]	19-Aug					300	28-Aug
1995							131 [a]	07-Aug
1996 [c]	0 [a]		0 [a]		0 [a]		0 [a]	

[a] Foot survey. All numbers not footnoted are aerial surveys.

[b] Weir count.

[c] Morris Cove stream was surveyed on July 24, August 7, and August 23, 1996. No salmon were seen on any of the surveys.

OTHER FISHERIES

Several smaller fisheries for other species also occur in the KMA. These include fisheries for wild rainbow trout, chum salmon, smelt, and clams. Because these fisheries are generally small, little specific management or research is directed towards them nor have specific management or fishery objectives been set for the fisheries. A brief summary of these fisheries is provided below.

RAINBOW TROUT

Wild stocks of rainbow trout occur in several systems within the Kodiak Archipelago. Some of the more well known rainbow trout systems include the Afognak River, Malina River, Upper

Station Creek and Little River. All of these populations are composed of small numbers of fish. Physical size is also small. Documenting the harvest is difficult because of the small fishing effort that these remote populations receive. Documenting harvest is further complicated because anglers confuse steelhead and rainbow trout. A steelhead is a type of rainbow trout which spends part of its life in salt water. On Kodiak, steelhead attain a larger size due to better growing conditions experienced in salt water. However, the only definite way to distinguish whether some fish are large rainbows or small steelhead is to examine a scale under a microscope for saltwater growth. Appendix A8 lists harvest estimates from the Statewide Harvest Survey for steelhead and rainbow trout. In 1997 an estimated 2,470 rainbow trout were caught within the Kodiak Island Archipelago.

Very little is known about the locations of rainbow trout populations in the Aleutians or in streams along the Alaska Peninsula draining into the Pacific. These populations are even more remote and less fished than the populations on Kodiak. For these reasons catch and harvest estimates are not listed for the Aleutians/Alaska Peninsula.

The average sport harvest and catch of wild rainbow trout from the waters of the Kodiak Regulatory Area from 1989 through 1997 is 535 and 3,325, respectively. In addition, approximately 20 roadside lakes are stocked along the Kodiak road system. The harvest and catch of rainbow trout from these lakes in 1997 was estimated by the Statewide Harvest Survey at 230 and 830, respectively (Appendix A8).

CHUM SALMON

Chum salmon have not been typically targeted by recreational anglers in the KMA, however, some are taken incidentally to other salmon species. An average of only 1,020 chum salmon have been harvested per year by sport anglers from KMA waters from 1977 through 1997 (Appendix A11). Most (74%) of the annual chum salmon harvest has occurred in the waters of the Kodiak Regulatory Area.

CLAMS

From 1977 through 1997, the average harvest of razor clams has been 3,590, all of which were reported from the Kodiak Regulatory Area (Appendix A7). Kodiak Island has a few beaches which produce razor clams. There probably is a reporting problem in that many people may be reporting all clams harvested as razor clams. It appears unlikely that the large harvests reported are possible given the small number of beaches which produce razor clams in the Kodiak Regulatory Area.

OTHER FISH

From 1977 through 1997, the average harvest of other fish in the Kodiak management area has been 5,110 (Table 4). This harvest has represented an average of 6% of the total sport fish harvest from KMA waters over this period. Other fish may include such species as cod, flounder and sculpins.

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APPENDIX A. RECREATIONAL FISH HARVESTS BY SPECIES, BY ANGLERS FISHING KODIAK MANAGEMENT AREA WATERS, 1977-1997

Appendix A1.-Number of Dolly Varden/Arctic char harvested by sport anglers fishing Kodiak Management Area waters, 1979-1997.

		Alaska Peninsula/Aleutian Island Regulatory Area						Kodiak Island Regulatory Area					
	KMA	Salt Water		Fresh Water		Area Total		Salt Water		Fresh Water		Area Total	
Year	Total	Harvest	Percent	Harvest	Percent	Total	% of KMA	Harvest	Percent	Harvest	Percent	Total	% of KMA
1979	33,311					7,890	24	5,281	21	20,140	79	25,421	76
1980	30,685					10,022	33	2,979	14	17,684	86	20,663	67
1981	31,482	3,402	28	8,564	72	11,966	38	2,441	13	17,075	88	19,516	62
1982	36,065	4,695	38	7,599	62	12,294	34	5,931	25	17,840	75	23,771	66
1983	30,192	2,843	26	7,910	74	10,753	36	3,934	20	15,505	80	19,439	64
1984	28,528	1,536	28	3,900	72	5,436	19	4,814	21	18,278	79	23,092	81
1985	22,562	659	13	4,387	87	5,046	22	2,291	13	15,225	87	17,516	78
1986	26,459	2,069	36	3,733	64	5,802	22	6,375	31	14,282	69	20,657	78
1987	15,831	2,083	30	4,985	71	7,068	45	2,299	26	6,464	74	8,763	55
1988	22,592	2,148	55	1,781	45	3,929	17	8,004	43	10,659	57	18,663	83
1989	18,635	1,392	32	2,977	68	4,369	23	2,771	19	11,495	81	14,266	77
1990	21,052	2,524	37	4,293	63	6,817	32	6,042	42	8,193	58	14,235	68
1991	21,418	3,920	47	4,416	53	8,336	39	2,996	23	10,086	77	13,082	61
1992	11,525	1,810	44	2,326	56	4,136	36	1,540	21	5,849	79	7,389	64
1993	10,008	1,677	45	2,032	55	3,709	37	1,644	26	4,655	74	6,299	63
1994	6,608	368	59	259	41	627	9	1,281	21	4,700	79	5,981	91
1995	9,263	867	31	1,927	69	2,794	30	1,337	21	5,131	79	6,468	70
1996	8,797	418	45	505	55	923	10	2,220	27	6,072	73	8,292	94
1997	7,459	463	46	543	54	1,006	13	1,537	22	5,379	78	6,916	93
MEAN [a]	20,656	1,934	38	3,655	62	5,943	27	3,459	24	11,301	76	14,759	71

[a] Averages for the fresh and saltwater fisheries for the Alaska Peninsula/Aleutian Islands Regulatory Area do not add up to the total average for the regulatory area due to incomplete data for the years 1979 through 1980.

Appendix A2.-Number of pink salmon harvested by sport anglers fishing Kodiak Management Area waters, 1979-1997.

		Alaska Peninsula/Aleutian Island Regulatory Area						Kodiak Island Regulatory Area					
	KMA	Salt Water		Fresh Water		Area Total		Salt Water		Fresh Water		Area Total	
Year	Total	Harvest	Percent	Harvest	Percent	Total	% of KMA	Harvest	Percent	Harvest	Percent	Total	% of KMA
1979	19,698					3,827	19	8,853	56	7,018	44	15,871	81
1980	30,093					11,124	37	8,223	43	10,746	57	18,969	63
1981	20,650	6,555	78	1,836	22	8,391	41	4,677	38	7,582	62	12,259	59
1982	30,462	8,593	74	3,019	26	11,612	38	8,153	43	10,697	57	18,850	62
1983	12,870	3,200	81	734	19	3,934	31	2,780	31	6,156	69	8,936	69
1984	17,343	4,011	88	553	12	4,564	26	4,314	34	8,465	66	12,779	74
1985	15,426	672	34	1,331	67	2,003	13	5,739	43	7,684	67	13,423	87
1986	17,365	350	12	2,506	88	2,856	16	4,769	33	9,740	67	14,509	84
1987	13,532	681	36	1,189	64	1,870	14	5,252	45	6,410	55	11,662	86
1988	31,296	1,640	13	10,612	87	12,252	39	10,040	53	9,004	47	19,044	61
1989	29,176	7,252	64	4,130	36	11,382	39	7,566	43	10,228	58	17,794	61
1990	29,997	12,301	55	10,232	45	22,533	75	2,476	33	4,988	67	7,464	25
1991	20,789	3,923	45	4,760	55	8,683	42	5,132	42	6,974	58	12,106	58
1992	11,473	2,538	46	3,031	54	5,569	49	2,113	36	3,791	64	5,904	51
1993	15,534	1,983	62	1,227	38	3,210	21	5,637	46	6,687	54	12,324	79
1994	6,032	594	85	102	15	696	12	2,147	40	3,189	60	5,336	88
1995	13,185	776	62	483	38	1,259	10	5,723	48	6,203	52	11,926	90
1996	7,370	336	74	117	26	453	6	2,927	42	3,990	58	6,917	94
1997	6,919	539	52	507	48	1,046	15	2,101	36	3,772	64	5,873	85
MEAN [a]	18,379	3,291	57	2,728	44	6,172	29	5,191	41	7,017	59	12,208	71

[a] Averages for the fresh and saltwater fisheries for the Alaska Peninsula/Aleutian Islands Regulatory Area do not add up to the total average for the regulatory area due to incomplete data for the years 1979 through 1980.

Appendix A3.-Number of coho salmon harvested by sport anglers fishing Kodiak Management Area waters, 1979-1997.

		Alaska Peninsula/Aleutian Island Regulatory Area						Kodiak Island Regulatory Area					
	KMA	Salt Water		Fresh Water		Area Total		Salt Water		Fresh Water		Area Total	
Year	Total	Harvest	Percent	Harvest	Percent	Total	% of KMA	Harvest	Percent	Harvest	Percent	Total	% of KMA
1979	12,496					974	8	3,606	31	7,916	69	11,522	92
1980	14,319					1,627	11	5,442	43	7,250	57	12,692	89
1981	11,696	475	43	637	57	1,112	10	4,449	42	6,135	58	10,584	91
1982	14,627	491	38	807	62	1,298	9	6,612	50	6,717	50	13,329	91
1983	9,678	943	51	912	49	1,855	19	2,025	26	5,798	74	7,823	81
1984	15,892	1,059	83	221	17	1,280	8	6,945	48	7,667	53	14,612	92
1985	15,032	523	37	884	63	1,407	9	6,209	46	7,416	54	13,625	91
1986	25,458	1,062	23	3,523	77	4,585	18	9,220	44	11,653	56	20,873	82
1987	19,402	1,567	63	923	37	2,490	13	8,056	48	8,856	52	16,912	87
1988	21,379	558	22	2,012	78	2,570	12	6,786	36	12,023	64	18,809	88
1989	23,700	2,288	59	1,610	41	3,898	16	5,338	27	14,464	73	19,802	84
1990	20,065	1,360	22	4,977	79	6,337	32	5,916	43	7,812	57	13,728	68
1991	21,327	1,045	29	2,591	71	3,636	17	6,790	62	10,901	62	17,691	83
1992	16,540	1,099	38	1,773	62	2,872	17	5,640	41	8,028	59	13,668	83
1993	22,693	965	66	487	34	1,452	6	7,877	37	13,364	63	21,241	94
1994	14,600	772	35	1,422	65	2,194	15	5,187	42	7,219	58	12,406	85
1995	15,194	989	51	969	49	1,958	13	6,063	46	7,173	54	13,236	87
1996	18,948	1,293	61	833	39	2,126	11	8,342	50	8,480	50	16,822	89
1997	25,491	482	28	1,246	72	1,728	7	12,149	51	11,614	49	23,763	93
MEAN [a]	17,818	998	44	1,519	56	2,389	13	6,455	43	8,973	59	15,428	87

[a] Averages for the fresh and saltwater fisheries for the Alaska Peninsula/Aleutian Islands Regulatory Area do not add up to the total average for the regulatory area due to incomplete data for the years 1979 through 1980.

Appendix A4.-Number of halibut harvested by sport anglers fishing KMA waters, 1977-1997.

		Alaska Peninsula			
	KMA	& Aleutian Islands		Kodiak Island	
Year	Total	Harvest	% of KMA	Harvest	% of KMA
1977	994	0	0	994	100
1978	1,721	0	0	1,721	100
1979	3,013	0	0	3,013	100
1980	3,651	0	0	3,651	100
1981	7,711	853	11	6,858	89
1982	9,977	797	8	9,180	92
1983	8,809	264	3	8,545	97
1984	9,148	969	11	8,179	89
1985	7,839	536	7	7,303	93
1986	11,975	1,015	9	10,960	92
1987	11,465	1,596	14	9,869	86
1988	9,697	1,948	20	7,749	80
1989	11,847	1,412	12	10,435	88
1990	11,679	2,545	22	9,134	78
1991	17,309	5,199	30	12,110	70
1992	13,505	2,645	20	10,860	80
1993	17,660	3,491	20	14,169	80
1994	17,312	2,402	14	14,910	86
1995	16,785	2,796	17	13,989	83
1996	17,982	3,343	19	14,639	81
1997	21,004	3,410	16	17,594	84
MEAN	11,004	1,677	12	9,327	88

Appendix A5.-Number of sockeye salmon harvested by sport anglers fishing Kodiak Management Area waters, 1979-1997.

		Alaska Peninsula/Aleutian Island Regulatory Area						Kodiak Island Regulatory Area					
	KMA	Salt Water		Fresh Water		Area Total		Salt Water		Fresh Water		Area Total	
Year	Total	Harvest	Percent	Harvest	Percent	Total	% of KMA	Harvest	Percent	Harvest	Percent	Total	% of KMA
1979	4,134					1,698	41	330	14	2,106	86	2,436	59
1980	4,114					1,936	47	809	37	1,369	63	2,178	53
1981	4,698	994	32	2,084	68	3,078	66	669	41	951	59	1,620	34
1982	4,532	1,058	72	419	28	1,477	33	1,079	35	1,976	65	3,055	67
1983	4,438	534	41	754	59	1,288	29	986	31	2,164	69	3,150	71
1984	6,358	913	94	60	6	973	15	1,272	24	4,113	76	5,385	85
1985	8,225	199	29	490	71	689	8	1,714	23	5,822	77	7,536	92
1986	6,233	174	18	800	82	974	16	1,590	30	3,669	70	5,259	84
1987	4,562	231	58	166	42	397	9	1,106	27	3,059	73	4,165	91
1988	8,853	2,198	84	433	16	2,631	30	1,019	16	5,203	84	6,222	70
1989	13,173	5,147	81	1,237	19	6,384	48	1,606	24	5,183	76	6,789	52
1990	8,224	1,181	54	987	46	2,168	26	1,985	33	4,071	67	6,056	74
1991	6,906	1,287	65	682	35	1,969	29	848	17	4,089	83	4,937	72
1992	8,408	1,470	68	698	32	2,168	26	1,299	21	4,941	79	6,240	71
1993	10,507	1,976	74	682	26	2,658	25	1,968	25	5,881	75	7,849	75
1994	13,502	374	37	626	63	1,000	7	1,825	15	10,677	85	12,502	93
1995	9,333	668	50	671	50	1,339	14	2,228	28	5,766	72	7,994	86
1996	11,727	931	59	638	41	1,569	13	2,780	27	7,378	73	10,158	87
1997	9,097	339	40	499	60	838	9	1,056	13	7,203	87	8,259	91
MEAN	7,738	1,157	56	702	44	1,854	26	1,377	25	4,506	75	5,884	74

Appendix A6.-Number of rockfish harvested by sport anglers fishing KMA waters, 1977-1997.

		Alaska Peninsula & Aleutian Islands		Kodiak Island	
Year	KMA Total	Harvest	% of KMA	Harvest	% of KMA
1977	2,810	0	0	2,810	100
1978	1,907	0	0	1,907	100
1979	3,599	0	0	3,599	100
1980	1,489	0	0	1,489	100
1981	6,663	421	6	6,242	94
1982	4,170	178	4	3,992	96
1983	3,314	62	2	3,252	98
1984	9,347	1,116	12	8,231	88
1985	4,890	199	4	4,691	96
1986	5,165	686	13	4,479	87
1987	8,547	2,046	24	6,501	76
1988	13,244	1,875	14	11,369	86
1989	5,325	255	5	5,070	95
1990	6,519	2,677	41	3,842	60
1991	9,259	1,044	11	8,215	89
1992	8,106	2,454	30	5,652	70
1993	8,350	781	9	7,569	91
1994	5,761	742	13	5,019	87
1995	4,806	559	12	4,247	88
1996	6,741	534	8	6,207	92
1997	7,656	334	4	7,322	96
MEAN	6,079	760	10	5,319	90

Appendix A7.-Number of clams harvested by sport anglers fishing KMA waters, 1977-1997.

	Kodiak Island
	Harvest
1977	7,474
1978	3,208
1979	8,363
1980	11,826
1981	3,452
1982	1,944
1983	2,000
1984	7,360
1985	4,970
1986	7,064
1987	2,155
1988	4,614
1989	1,477
1990	173
1991	119
1992	973
1993	1,286
1994	4,322
1995	0
1996	1,970
1997	533
MEAN	3,585

Appendix A8.-Number of rainbow trout and steelhead caught and harvested by sport anglers fishing in fresh waters of the Kodiak regulatory area, 1989-1997.

	Rainbow Trout Stocked Lakes[a]		Rainbow Trout Wild Populations[b]		Steelhead Fresh water[c]	
Year	Caught	Harvested	Caught	Harvested	Caught	Harvested
1989		777		807		489
1990	2,831	812	4,352	672	3,108	672
1991	843	472	8,346	765	1,720	244
1992	1,314	901	3,324	246	1,552	80
1993	1,055	135	2,750	128	6,480	199
1994	1,062	470	2,751	261	3,400	146
1995	357	151	1,739	132	1,922	64
1996	1,331	334	1,702	131	1,283	7
1997	834	231	1,636	240	3093	75

[a] Listed under roadside lakes in the Statewide Harvest Survey. Reports of harvested steelhead are assumed to be rainbow trout.

[b] Listed under other streams, other lakes, Buskin, Pasagshak and Saltery rivers in the Statewide Harvest Survey report. Only fish reported as rainbow trout are counted.

[c] Listed under Buskin, Pasagshak, Karluk, Red and Saltery, other streams and other lakes. Saltwater catches are not included. In the Karluk and Red rivers rainbow trout are considered as steelhead.

Appendix A9.-Number of smelt harvested by sport anglers fishing KMA waters, 1977-1997.

	KMA	Alaska Peninsula & Aleutian Islands		Kodiak Island	
Year	Total	Harvest	% of KMA	Harvest	% of KMA
1977	9,969	4,317	43	5,652	57
1978	4,523	4,523	100	0	0
1979	2,515	1,572	63	943	38
1980	4,103	2,011	49	2,092	51
1981	3,024	864	29	2,160	71
1982	2,620	0	0	2,620	100
1983	0	0	0	0	0
1984	96	96	100	0	0
1985	25	0	0	25	100
1986	0	0	0	0	0
1987	462	0	0	462	100
1988	0	0	0	0	0
1989	0	0	0	0	0
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	1,222	1,082	89	140	11
1993	67	0	0	67	100
1994	0	0	0	0	0
1995	0	0	0	0	0
1996		0	0	0	0
1997	84	84	100	0	0
MEAN	1,367	693	27	674	30

Appendix A10.-Number of chinook salmon harvested by sport anglers fishing Kodiak Management Area waters, 1979-1997.

		Alaska Peninsula/Aleutian Island Regulatory Area						Kodiak Island Regulatory Area					
	KMA	Salt Water		Fresh Water		Area Total		Salt Water		Fresh Water		Area Total	
Year	Total	Harvest	Percent	Harvest	Percent	Total	% of KMA	Harvest	Percent	Harvest	Percent	Total	% of KMA
1979	1,176					424	36	98	13	654	87	752	64
1980	723					396	55	60	18	267	82	327	45
1981	1,264	129	28	346	73	475	38	194	25	595	75	789	62
1982	2,576	1,351	93	105	7	1,456	57	167	15	953	85	1,120	44
1983	1,295	493	87	73	13	566	44	198	27	531	3	729	56
1984	1,196	112	41	163	59	275	23	210	23	711	77	921	77
1985	1,133	0	0	371	100	371	33	162	21	600	79	762	67
1986	830	0	0	310	100	310	37	168	32	352	68	520	63
1987	1,002	42	7	581	93	623	62	54	14	325	86	379	38
1988	2,153	31	5	558	95	589	27	145	9	1,419	91	1,564	73
1989	2,226	234	21	905	80	1,139	51	120	11	967	89	1,087	49
1990	1,156	140	88	20	13	160	14	66	7	930	93	996	86
1991	2,752	56	23	168	77	244	9	198	8	2,310	92	2,508	91
1992	2,671	210	46	244	54	454	17	585	26	1,632	74	2,217	83
1993	5,738	147	23	499	67	646	11	2,454	48	2,638	52	5,092	89
1994	3,303	117	85	20	15	137	4	668	21	2,498	79	3,166	96
1995	2,859	25	11	212	89	237	8	1,138	43	1,484	57	2,622	92
1996	2,755	138	48	147	52	285	10	1,410	57	1,060	43	2,470	90
1997	5,465	77	32	167	68	244	4	2,722	52	2,499	48	5,221	96
MEAN [a]	2,225	194	38	288	62	475	28	569	25	1,180	72	1,750	72

[a] Averages for the fresh and saltwater fisheries for the Alaska Peninsula/Aleutian Islands Regulatory Area do not add up to the total average for the regulatory area due to incomplete data for the years 1977 through 1980.

Appendix A11.-Number of chum salmon harvested by sport anglers fishing Kodiak Management Area waters, 1979-1997.

		Alaska Peninsula /Aleutian Island Regulatory Area						Kodiak Island Regulatory Area					
	KMA	Salt Water		Fresh Water		Area Total		Salt Water		Fresh Water		Area Total	
Year	Total	Harvest	Percent	Harvest	Percent	Total	% of KMA	Harvest	Percent	Harvest	Percent	Total	% of KMA
1979	591					91	15	382	76	118	24	500	85
1980	1,334					809	61	405	77	120	23	525	39
1981	1,166	335	63	194	37	529	45	151	24	486	76	637	55
1982	2,567	472	38	771	62	1,243	48	639	48	685	52	1,324	52
1983	963	0	0	147	100	147	15	462	57	354	43	816	85
1984	1,609	126	44	162	56	288	18	799	61	522	40	1,321	82
1985	915	0	0	50	100	50	6	167	19	698	81	865	95
1986	541	25	12	180	88	205	38	122	36	214	64	336	62
1987	792	23	10	209	90	232	29	198	35	362	65	560	71
1988	1,824	0	0	278	100	278	15	73	5	1,473	95	1,546	85
1989	941	104	34	206	67	310	33	225	36	406	64	631	67
1990	412	0	0	221	100	221	54	36	19	155	81	191	46
1991	1,612	0	0	95	100	95	6	417	27	1,100	73	1,517	94
1992	913	273	95	15	5	288	32	92	15	533	85	625	68
1993	786	282	100	0	0	282	36	252	50	252	50	504	64
1994	380	83	92	7	8	90	24	100	34	190	66	290	76
1995	1,144	10	6	153	94	163	14	441	45	540	55	981	86
1996	701	0	0	9	100	9	1	199	29	493	71	692	99
1997	254	19	100	0	0	19	7	120	51	115	49	235	93
MEAN [a]	1,023	103	35	159	65	282	26	278	39	464	61	742	74

[a] Averages for the fresh and saltwater fisheries for the Alaska Peninsula/Aleutian Islands Regulatory Area do not add up to the total average for the regulatory area due to incomplete data for the years 1977 through 1980.

Appendix A12.-Number of steelhead trout harvested by sport anglers fishing Kodiak Management Area waters, 1977-1997.

	Kodiak Island Regulatory Area				
	Salt Water		Fresh Water[a]		Area Total
Year	Harvest	Percent	Harvest	Percent	Total
1977	3	1	229	99	232
1978	0	0	162	100	162
1979	9	3	309	97	318
1980	17	3	654	98	671
1981	0	0	313	100	313
1982	0	0	259	100	259
1983	10	3	292	97	302
1984	124	18	572	82	696
1985	426	54	364	46	790
1986	168	52	153	48	321
1987	181	72	72	29	253
1988	636	67	308	33	944
1989	249	34	489	66	738
1990	448	40	672	60	1120
1991	428	64	244	36	672
1992	48	38	80	62	128
1993	249	55	199	45	448
1994	97	40	146	60	243
1995	30	32	64	68	94
1996	7	18	31	82	38
1997	0	0	75	100	75
MEAN	149	28	271	72	420

Note: No significant harvest occurs in the Alaska Peninsula/Aleutian Island Regulatory area. All reported harvest is from the Kodiak Island Regulatory area.

[a] Listed in Mills as steelhead under Buskin, Pasagshak, Karluk, Red, Saltery, other streams and other lakes. In the Karluk and Red rivers rainbow trout are also considered to be steelhead.

Appendix A13.-Number of Arctic grayling harvested by sport anglers fishing KMA waters, 1977-1997.

	Kodiak Island Harvest[a]
1977	54
1978	325
1979	124
1980	465
1981	119
1982	225
1983	126
1984	286
1985	820
1986	15
1987	72
1988	182
1989	189
1990	86
1991	98
1992	120
1993	16
1994	41
1995	0
1996	0
1997	0
MEAN	160

[a] All of the harvest occurs in fresh water.

APPENDIX B

Appendix B1.-Commercial harvests (thousands of fish) of pink salmon from KMA waters, 1977-1998.

	ALASKA PENINSULA/ALEUTIAN ISLAND AREA						
YEAR	SOUTH PENINSULA	NORTH PENINSULA	ALEUTIAN	AREA TOTAL	CHIGNIK	KODIAK	GRAND TOTAL
1979	6,571	5	539	7,115	2,057	11,287	20,459
1980	7,962	302	2,598	10,861	1,126	17,290	29,277
1981	5,036	11	303	5,350	1,163	10,337	16,850
1982	6,735	12	1,448	8,195	876	8,076	17,147
1983	2,828	3	2	2,833	321	4,603	7,757
1984	11,589	27	2,310	13,926	446	10,884	25,256
1985	4,434	3	0	4,437	175	7,335	11,947
1986	4,032	23	43	4,097	647	11,504	16,248
1987	1,209	4	0	1,212	247	5,073	6,532
1988	7,045	65	183	7,293	2,997	14,262	24,552
1989	7,293	4	7	7,304	888	22,649	30,841
1990	2,866	518	283	3,666	555	5,984	10,205
1991	10,616	4	0	10,620	1,169	16,643	28,432
1992	9,770	194	312	10,276	1,554	3,311	15,141
1993	9,928	5	0	9,933	1,648	34,019	45,600
1994	9,180	225	859	10,265	431	8,163	18,859
1995	16,294	12	0	16,306	2,065	42,831	61,202
1996	2,189	54	0	2,243	184	3,467	5,894
1997	2,304	51	0	2,355	844	11,035	14,234
1998	8,041	35	0	8,075	777	22,062	30,914

Appendix B2.-Commercial harvests (thousands of fish) of coho salmon from KMA waters, 1979-1998.

	ALASKA PENINSULA/ALEUTIAN ISLAND AREA						
YEAR	SOUTH PENINSULA	NORTH PENINSULA	ALEUTIAN	AREA TOTAL	CHIGNIK	KODIAK	GRAND TOTAL
1979	356	113	0	469	93	141	703
1980	274	128	0	402	118	139	659
1981	162	155	0	318	79	122	519
1982	256	238	0	494	300	344	1,138
1983	128	75	0	203	62	158	423
1984	309	199	0	508	110	230	848
1985	173	168	0	341	207	284	832
1986	236	164	0	400	117	168	685
1987	225	172	0	397	150	192	739
1988	506	234	0	740	370	303	1,413
1989	444	228	0	672	67	141	880
1990	307	193	0	500	130	294	924
1991	317	217	0	534	166	325	1,025
1992	418	207	0	625	311	280	1,216
1993	220	64	0	284	229	313	826
1994	256	241	0	497	237	296	1,030
1995	263	136	0	399	282	308	989
1996	279	157	0	436	193	202	831
1997	112	95	0	207	91	381	679
1998	154	135	0	289	130	425	844

Appendix B3.-Commercial harvests (thousands of fish) of sockeye salmon from KMA waters, 1979-1998.

	ALASKA PENINSULA/ALEUTIAN ISLAND AREA						
YEAR	SOUTH PENINSULA	NORTH PENINSULA	ALEUTIAN	AREA TOTAL	CHIGNIK	KODIAK	GRAND TOTAL
1979	1,150	1,980	12	3,142	1,064	632	4,838
1980	3,614	1,397	9	5,020	846	651	6,517
1981	2,255	1,845	5	4,105	1,840	1,289	7,234
1982	2,346	1,435	3	3,784	1,522	1,205	6,511
1983	2,557	2,093	4	4,654	1,823	1,232	7,709
1984	2,318	1,735	67	4,120	2,662	1,951	8,733
1985	2,215	2,601	3	4,819	946	1,843	7,608
1986	1,223	2,437	8	3,668	1,646	3,155	8,469
1987	1,450	1,209	0	2,659	1,899	1,793	6,351
1988	1,473	1,528	4	3,005	796	2,698	6,499
1989	2,661	1,719	8	4,388	1,157	2,629	8,174
1990	2,387	2,416	12	4,815	2,094	5,248	12,157
1991	2,322	2,392	1	4,715	1,896	5,704	12,315
1992	3,446	3,575	3	7,024	1,277	4,168	12,469
1993	3,689	3,867	0	7,556	1,697	4,378	13,631
1994	2,107	2,753	0	4,860	1,619	2,877	9,356
1995	3,039	3,273	0	6,311	1,724	4,485	12,520
1996	1,521	1,911	0	3,432	1,958	4,970	13,792
1997	2,258	2,151	0	4,409	758	2,503	7,671
1998	2,171	1,088	0	3,258	1,042	3,623	7,923

Appendix B4.-Commercial harvests (thousands of fish) of chinook salmon from KMA waters, 1979-1998.

	ALASKA PENINSULA/ALEUTIAN ISLAND AREA						
YEAR	SOUTH PENINSULA	NORTH PENINSULA	ALEUTIAN	AREA TOTAL	CHIGNIK	KODIAK	GRAND TOTAL
1979	2	17	0	19	1	2	22
1980	5	17	0	22	2	1	25
1981	10	18	0	28	3	1	32
1982	10	30	0	40	5	1	46
1983	27	30	0	57	6	4	67
1984	9	23	0	32	4	5	41
1985	8	24	0	32	2	5	39
1986	6	12	0	18	3	4	25
1987	9	14	0	23	3	5	31
1988	11	17	0	28	7	22	57
1989	7	11	0	18	4	5	27
1990	17	12	0	29	10	19	58
1991	8	9	0	17	3	22	42
1992	8	13	0	21	11	24	56
1993	14	24	0	38	20	42	100
1994	10	19	0	28	4	23	55
1995	17	8	0	25	5	19	49
1996	5	5	0	10	3	13	26
1997	7	10		18	3	19	40
1998	5	6		11	4	17	32

Appendix B5.-Commercial harvests (thousands of fish) of chum salmon from KMA waters, 1979-1998.

	ALASKA PENINSULA/ALEUTIAN ISLAND AREA						
YEAR	SOUTH PENINSULA	NORTH PENINSULA	ALEUTIAN	AREA TOTAL	CHIGNIK	KODIAK	GRAND TOTAL
1979	483	66	0	549	188	358	1,095
1980	1,351	700	5	2,056	313	1,076	3,445
1981	1,770	707	7	2,484	580	1,345	4,409
1982	2,273	331	6	2,610	390	1,266	4,266
1983	1,707	349	11	2,067	159	1,085	3,311
1984	1,657	797	34	2,487	63	649	3,200
1985	1,393	671	14	2,078	26	431	2,535
1986	1,750	271	39	2,060	177	1,126	3,363
1987	1,376	369	0	1,745	127	682	2,554
1988	1,905	394	1	2,300	267	1,426	3,993
1989	994	157	0	1,151	2	836	1,989
1990	1,238	126	1	1,365	270	577	2,212
1991	1,587	191	0	1,778	261	1,029	3,068
1992	1,317	342	1	1,660	222	680	2,562
1993	1,048	135	0	1,183	122	588	1,893
1994	2,192	84	1	2,276	227	739	3,242
1995	1,723	99	0	1,823	381	1,532	3,736
1996	776	68	0	844	100	544	1,488
1997	606	97	0	704	156	0	860
1998	712	70	0	781	129	520	1,430

APPENDIX C

Appendix C1.-Commercial harvest of chinook salmon from statistical areas along the Kodiak road system, 1980-1998.

Year	Monashka 259-10	Womens Bay 259-22	Middle Bay 259-23	Kalsin Bay 259-24	Chiniak Pt 259-25	Outer 259-21	Chiniak-Monaskha Total	Pasagshak-Saltery 259-41
1980	0	4	0	36	0	0	40	2
1981	15	1	0	58	1	0	75	71
1982	4	6	8	51	4	0	73	10
1983	3	29	2	65	90	32	221	140
1984	0	3	0	4	0	10	17	189
1985	1	3	0	9	1	1	15	23
1986	0	3	0	0	0	0	3	0
1987	0	1	1	16	0	1	19	202
1988	6	6	13	61	23	26	135	10
1989[a]	0	0	0	0	0	0	0	0
1990	0	2	4	11	0	10	27	410
1991	0	2	7	49	218	7	283	180
1992	0	0	0	0	144	15	159	27
1993	0	1	1	5	27	11	45	281
1994	0	0	0	3	263	42	308	78
1995	3	1	2	4	2	2	14	106
1996	0	0	0	0	6	0	6	31
1997	13	0	4	14	520	72	623	57
1998	0	0	0	6	1	12	19	11

[a] No commercial harvest in 1989 due to possible contamination from Exxon Valdez oil spill.

Appendix C2.-Commercial harvest of sockeye salmon from statistical areas along the Kodiak road system, 1980-1998.

Year	Monashka 259-10	Womens Bay 259-22	Middle Bay 259-23	Kalsin Bay 259-24	Chiniak Pt 259-25	Outer 259-21	Chiniak-Monaskha Total	Pasagshak-Saltery 259-41
1980	9	2	4	14	0	1	30	315
1981	59	29	30	116	200	61	495	21,792
1982	370	252	5	45	22	59	753	2,747
1983	292	212	11	238	479	282	1,514	5,727
1984	738	302	153	48	3	491	1,735	16,937
1985	205	75	12	44	1	272	609	3,508
1986	1,522	106	1	3	0	214	1,846	16,203
1987	3,251	256	147	17	1	16	3,688	3,405
1988	244	92	8	89	9	289	731	2,747
1989[a]	0	0	0	0	0	0	0	0
1990	0	17	3	0	0	494	514	12,595
1991	92	16	1	534	13,153	609	14,405	6,787
1992	1,625	0	0	0	48,228	3,086	52,939	5,900
1993	0	9	1	26	2,864	3,941	6,841	34,638
1994	19	3	0	14	2,718	1,134	3,888	11,903
1995	23	80	79	67	584	153	986	19,591
1996	0	0	0	0	1,070	0	1,070	3,646
1997	60	0	0	2	4,441	3,749	8,252	1,946
1998	17	2	2	10	16	59	106	598

[a] No commercial harvest in 1989 due to possible contamination from Exxon Valdez oil spill.

Appendix C3.-Commercial harvest of coho salmon from statistical areas along the Kodiak road system, 1980-1998.

Year	Monashka 259-10	Womens Bay 259-22	Middle Bay 259-23	Kalsin Bay 259-24	Chiniak Pt 259-25	Outer 259-21	Chiniak-Monaskha Total	Pasagshak-Saltery 259-41
1980	275	543	433	6,069	75	837	8,232	1,832
1981	290	1,106	30	1,366	644	1,197	4,633	1,048
1982	495	5,245	121	1,839	700	3,105	11,505	2,787
1983	330	886	73	766	2,068	2,614	6,737	2,316
1984	1,240	5,282	2	4,252	192	3,580	14,548	1,485
1985	86	666	298	332	3	1,523	2,908	1,619
1986	77	1,065	71	447	0	181	1,841	1,189
1987	916	2,334	359	3,310	235	6,330	13,484	9,425
1988	319	254	89	1,773	345	1,349	4,129	2,787
1989[a]	0	0	0	0	0	0	0	0
1990	0	1	1	7	0	91	100	46
1991	73	15	4	178	5,630	607	6,507	94
1992	97	0	0	0	6,604	369	7,070	222
1993	0	7	73	40	969	544	1,633	714
1994	649	15	0	2	2,317	641	3,624	106
1995	336	224	1,303	3,988	748	420	7,019	927
1996	0	0	0	0	94	0	94	346
1997	1,100	0	31	3,011	4,202	6,995	15,339	41
1998	24	9	129	10	3	193	368	48

[a] No commercial harvest in 1989 due to possible contamination from Exxon Valdez oil spill.

Appendix C4.-Commercial harvest of pink salmon from statistical areas along the Kodiak road system, 1980-1998.

Year	Monashka 259-10	Womens Bay 259-22	Middle Bay 259-23	Kalsin Bay 259-24	Chiniak Pt 259-25	Outer 259-21	Chiniak-Monaskha Total	Pasagshak-Saltery 259-41
1980	15,743	37,055	16,644	211,390	6,536	14,100	301,468	44,674
1981	34,942	60,684	22,204	156,663	98,895	43,532	416,920	220,819
1982	60,272	153,342	10,652	100,775	26,709	71,919	423,669	794
1983	13,878	46,923	8,775	58,957	17,244	48,103	193,880	20,175
1984	9,843	51,510	2,507	18,580	9,097	37,464	129,001	20,169
1985	292	101,537	7,915	18,425	2,741	72,499	203,409	2,465
1986	24,694	48,689	629	15,333	0	12,955	102,300	1,036
1987	30,959	136,068	52,766	36,654	5,665	14,555	276,667	5,962
1988	89,121	118,140	26,493	59,461	38,691	87,339	419,245	794
1989[a]	0	0	0	0	0	0	0	0
1990	4,311	3,157	7,689	10,847	0	5,436	31,440	5,870
1991	350	21,781	23,261	68,380	86,842	95,824	296,438	20,143
1992	760	138	567	57	32,028	2,021	35,571	1,992
1993	0	2,045	116,360	97,652	168,770	64,055	448,882	107,668
1994	38,793	956	0	19,534	23,332	9,172	91,787	2,530
1995	92,353	152,975	233,051	190,894	165,292	153,512	988,077	187,109
1996	0	0	0	0	4,512	0	4,512	5,139
1997	10,013	0	1,495	2,090	15,498	2,775	31,871	4,484
1998	19,176	14,457	44,934	10,599	167	84,729	174,062	117

[a] No commercial harvest in 1989 due to possible contamination from Exxon Valdez oil spill.

Appendix C5.-Commercial harvest of chum salmon from statistical areas along the Kodiak road system, 1980-1998.

Year	Monashka 259-10	Womens Bay 259-22	Middle Bay 259-23	Kalsin Bay 259-24	Chiniak Pt 259-25	Outer 259-21	Chiniak-Monaskha Total	Pasagshak-Saltery 259-41
1980	1,798	6,683	4,047	17,076	3,455	2,338	35,397	18,879
1981	1,542	9,847	5,905	19,063	3,408	2,122	41,887	83,607
1982	4,210	9,566	8,094	12,302	1,458	858	36,488	6,802
1983	519	3,940	749	4,542	984	1,071	11,805	24,036
1984	1,313	3,983	115	3,455	81	1,857	10,804	13,748
1985	620	6,513	1,599	6,649	2,469	2,514	20,364	589
1986	1,320	6,463	2,073	1,185	0	182	11,223	3,217
1987	2,492	9,463	9,311	6,183	139	1,822	29,410	5,408
1988	3,616	17,290	19,966	10,148	11,973	8,687	71,680	6,802
1989[a]	0	0	0	0	0	0	0	0
1990	30	1,242	2,033	556	0	1,822	5,683	2,508
1991	30	1,143	4,391	3,671	14,291	3,691	27,217	5,885
1992	196	17	392	0	15,223	1,184	17,012	3,751
1993	0	22	759	325	1,363	525	2,994	599
1994	141	1,173	0	887	10,054	6,376	18,631	1,940
1995	249	5,116	13,121	5,407	2,801	6,901	33,595	13,574
1996	0	0	0	0	2,333	0	2,333	3,186
1997	30	0	278	705	21,810	6,918	29,741	3,156
1998	27	62	402	21	2	388	902	61

[a] No commercial harvest in 1989 due to possible contamination from Exxon Valdez oil spill.

APPENDIX D

Appendix D1.-Subsistence harvests of salmon from locations along the Kodiak road system, 1980-1997.

	1980					1983				
AREA	Chinook	Sockeye	Coho	Pink	Chum	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	0	36	68	138	11	0	37	11	36	14
Womens Bay	0	30	144	94	2	0	44	106	241	36
Middle Bay	0	0	8	4	52	0	90	43	77	10
Kalsin Bay	2	13	0	18	1	1	27	64	60	12
Buskin River	17	4,279	1,239	751	94	11	5,690	1,470	672	66
Chiniak	13	153	256	332	56	0	40	427	154	37
Roslyn Creek	0	10	137	45	20	0	0	20	8	3
Isthmus Pt.	0	0	21	5	5	0	0	6	0	0 a
Cliff Pt.	0	8	29	31	6			21	1	0
Chiniak Bay Total	32	4,529	1,902	1,418	247	12	5,928	2,168	1,249	178
Saltery	0	68	0	27	0			4		5
Pasagshak	0	0	18	23	0	5	365	20	10	
(Permits returned island wide 756 = 61%						(Permits returned island wide 1,082 = 83%				
Permits issued island wide 1,239)						Permits issued island wide 1,307)				

	1981					1984				
AREA	Chinook	Sockeye	Coho	Pink	Chum	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	0	15	5	95	32	0	45	156	42	8
Womens Bay	0	38	20	174	53	0	6	91	83	21
Middle Bay	0	4	1	28	19	0	0	0	0	0
Kalsin Bay	0	4	152	142	8	1	8	445	68	38
Buskin River	1	4,742	860	533	45	26	565	109	29	10
Chiniak	3	368	306	123	16	1	0	249	69	64
Roslyn Creek	0	0	88	15	3	0	0	100	37	10
Isthmus Pt.	0	0	0	0	0	0	0	0	0	0
Cliff Pt.	0	28	0	1	2	1	0	6	0	0
Chiniak Bay Total	4	5,199	1,432	1,111	178	29	624	1,156	328	151
Saltery	0	3	1	1	0	1	3	44	0	3
Pasagshak	0	28	16	21	0	13	491	76	12	0
(Permits returned island wide 733 = 63%						(Permits returned island wide 1,084 = 87%				
Permits issued island wide 1,166)						Permits issued island wide 1,240)				

	1982					1985				
AREA	Chinook	Sockeye	Coho	Pink	Chum	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	0	36	76	31	3	0	67	113	62	2
Womens Bay	0	131	115	192	23	2	767	656	162	34
Middle Bay	0	13	95	110	10	0	1	15	0	0
Kalsin Bay	0	66	279	180	24	0	15	337	153	159
Buskin River	22	6,748	1,754	1,340	87	21	5,326	1,898	728	117
Chiniak	0	25	470	168	46	0	6	89	13	46
Roslyn Creek	0	0	245	37	0	0	10	221	22	48
Isthmus Pt.	0	0	0	0	0	2	0	41	0	4 a
Cliff Pt.	0	0	0	0	0	0	3	0	0	0
Chiniak Bay Total	22	7,019	3,034	2,058	193	25	6,195	3,370	1,140	410
Saltery	0	0	42	0	0	1	62	82	35	9
Pasagshak	1	83	17	18	0	3	163	117	2	0
(Permits returned island wide 993 = 78%						(Permits returned island wide 1,204 = 82%				
Permits issued island wide 1,276)						Permits issued island wide 1,476)				

-continued-

Appendix D1.-Page 2 of 3.

1986

AREA	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	12	0	114	138	58	9
Womens Bay	5	0	60	33	0	1
Middle Bay	2	0	0	2	14	0
Kalsin Bay	15	0	29	312	23	35
Buskin River	362	7	5,303	2,585	934	110
Chiniak	7	0	4	90	49	20
Roslyn Creek	8	0	5	188	5	24
Isthmus Pt.	1	0	0	20	0	0
Cliff Pt.	0	0	0	0	0	0
Chiniak Bay Total	412	7	5,515	3,368	1,083	199
Saltery		0	199	91	1	0
Pasagshak		6	64	35	5	0

(Permits returned island wide 1,080 = 87%
Permits issued island wide 1,243)

1989

AREA	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	8	1	7	83	31	1
Womens Bay	4	0	23	50	0	10
Middle Bay	0	0	0	0	0	0
Kalsin Bay	14	0	4	143	25	7
Buskin River	206	5	3,312	1,251	425	74
Chiniak	5	0	35	70	3	10
Roslyn Creek	10	0	10	262	5	42
Isthmus Pt.	2	0	0	6	0	0
Cliff Pt.	0	0	0	0	0	0
Chiniak Bay Total	249	6	3,391	1,859	489	144
Saltery		0	179	0	3	0
Pasagshak		0	78	28	22	1

(Permits returned island wide 687 b

1987

AREA	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	16	0	23	133	109	20
Womens Bay	1	0	0	4	12	7
Middle Bay	23	0	144	33	25	4
Kalsin Bay	18	0	80	379	50	27
Buskin River	300	61	3,375	1,743	541	75
Chiniak	2	0	50	25	2	10
Roslyn Creek	15	2	23	311	78	46
Isthmus Pt.	0	0	0	0	0	0
Cliff Pt.	1	0	28	0	1	2
Chiniak Bay Total	376	63	3,695	2,633	817	189
Saltery		1	87	67	35	23
Pasagshak		9	82	51	13	15

(Permits returned island wide 969 = 86%
Permits issued island wide 1,124)

1990

AREA	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	15	0	20	167	22	22
Womens Bay	8	0	67	36	9	9
Middle Bay	2	0	0	14	0	0
Kalsin Bay	20	1	4	379	61	48
Buskin River	291	8	3,448	1,785	325	91
Chiniak	6	0	112	26	36	3
Roslyn Creek	12	0	11	249	6	16
Isthmus Pt.	0	0	0	0	0	0
Cliff Pt.	1	0	0	0	10	0
Chiniak Bay Total	355	9	3,662	2,656	469	189
Saltery	9	14	303	7	3	0
Pasagshak	35	3	598	60	11	15

(Permits returned island wide = 1,176b

1988

AREA	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	12	0	40	110	88	2
Womens Bay	7	0	0	81	9	25
Middle Bay	0	0	0	0	0	0
Kalsin Bay	13	0	61	209	53	16
Buskin River	220	30	3,099	1,475	313	55
Chiniak	2	0	0	10	0	0
Roslyn Creek	9	1	0	299	44	37
Isthmus Pt.	0	0	0	0	0	0
Cliff Pt.	0	0	0	0	0	0
Chiniak Bay Total	263	31	3,200	2,184	507	135
Saltery		3	145	17	10	2
Pasagshak		0	84	0	11	9

(Permits returned island wide 663 = 60%
Permits issued island wide 1,098)

1991

AREA	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum
		0	15	85	10	3
		0	30	24	19	14
		0	0	60	3	6
		1	6	247	70	57
		7	4,301	1,449	208	56
		0	0	37	0	0
		0	0	160	39	17
		0	0	0	0	0
		0	0	10	0	0
		8	4,352	2,072	349	153
		2	406	3	27	78
		2	1,645	216	60	10

(Permits returned island wide = 1,145)

-continued-

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1992

AREA	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay		5	31	202	27	0
Womens Bay		0	28	64	18	2
Middle Bay		14	0	0	0	0
Kalsin Bay		0	147	276	21	2
Buskin River		25	3,295	1,499	267	114
Chiniak		3	48	169	57	16
Roslyn Creek		7	1	236	11	13`
Mayflower		0	23	0	0	0
Chiniak Bay Total		54	3,550	2,469	401	147
Saltery		2	309	0	6	14
Pasagshak		5	1,499	118	34	7

(Permits returned island wide = 851 as of 4/19/93)

1993

AREA	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	7	0	12	32	3	12
Womens Bay	3	0	0	4	3	10
Middle Bay	1	0	0	3	0	0
Kalsin Bay	9	4	0	82	17	0
Buskin River	277	56	4,745	1,719	375	51
Chiniak	4	2	0	49	51	0
Roslyn Creek	10	9	1	148	4	17
Mayflower	2	0	0	25	0	6
Chiniak Bay Total	313	71	4,758	2,062	453	96
Saltery	17	1	328	33	17	0
Pasagshak	85	2	2,253	276	115	15

1994

AREA	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	29	0	12	238	3	0
Womens Bay	5	0	16	26	0	0
Middle Bay	2	0	0	0	6	0
Kalsin Bay	32	4	2	225	55	35
Buskin River	507	30	4,899	2,167	414	35
Chiniak	25	40	12	180	3	3
Roslyn Creek	0	0	0	0	0	0
Mayflower	8	0	0	54	3	8
Chiniak Bay Total	608	74	4,941	2,890	484	81
Saltery	30	2	392	110	11	18
Pasagshak	98	7	1,554	112	73	25

1995

AREA	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	12	0	2	58	12	6
Womens Bay	21	0	16	24	9	4
Middle Bay	2	0	0	2	4	1
Kalsin Bay	23	1	3	116	59	57
Buskin River	437	40	5,547	1,285	394	28
Chiniak	12	1	40	41	8	2
Roslyn Creek	8	0	1	120	16	14
Mayflower	1	0	0	16	0	0
Chiniak Bay Total	516	42	5,609	1,662	502	112
Saltery	21	13	432	73	27	24
Pasagshak	133	14	2,099	65	58	34

1996

AREA	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	4	0	0	11	0	0
Womens Bay	11	0	0	109	17	0
Middle Bay	1	0	0	15	0	0
Kalsin Bay	20	5	5	305	61	69
Buskin River	423	67	5,403	1,263	159	14
Chiniak	2	0	0	35	11	4
Roslyn Creek	9	1	0	76	0	5
Mayflower	3	0	0	6	0	3
Chiniak Bay Total	473	73	5,408	1,820	248	95
Saltery	15	0	264	0	0	0
Pasagshak	165	23	2,854	196	19	7

1997

AREA	Permits Returned	Chinook	Sockeye	Coho	Pink	Chum
Monashka Bay	2	0	14	3	0	0
Womens Bay	2	0	2	34	0	3
Middle Bay	5	0	1	6	36	1
Kalsin Bay	17	0	50	363	19	24
Buskin River	329	162	5,890	1,411	339	13
Chiniak	13	28	20	104	15	1
Roslyn Creek	5	0	0	85	30	0
Mayflower	0	0	0	0	0	0
Chiniak Bay Total	373	190	5,977	2,006	439	42
Saltery	12	1	348	33	10	0
Pasagshak	112	0	2,759	88	48	2

[a] Fishing occurred at Mayflower not Isthmus Pt.

[b] Beginning in 1989, 2,900 permits were mailed out to potential subsistence fishermen.

APPENDIX E

Appendix E1.-Coho salmon escapement index counts for streams along the Kodiak road system, 1980-1998.

	Monashka		Pillar		Buskin[a]		Sargent		Russian		Salonie	
Year	Count	Date	Count	Date	Count	Date	Count	Date	Count	Date	Count	Date
1980	72	20-Oct	68	20-Oct	1,021	20-Oct	72	20-Oct	68	20-Oct	1,021	20-Oct
1981	57	28-Oct	33	28-Oct	919	28-Oct	44	26-Oct	47	26-Oct	919	28-Oct
1982					500 [a]	27-Aug	130	04-Nov	87	28-Oct	388	26-Oct
					750 [a]	07-Oct						
1983	24	20-Oct	15	20-Oct	243	26-Oct	16	24-Oct	23	24-Oct	127	24-Oct
1984					1,905	19-Sep	61	05-Nov	150 [a]	11-Sep	300 [a]	11-Sep
1985	135	11-Sep	140	28-Oct	9,474 [b]	26-Oct	87	28-Oct	358	28-Oct	30 [a]	12-Sep
											189	31-Oct
											67	25-Oct
1986	172	17-Oct	44	17-Oct	9,939 [b]	02-Oct	41	26-Oct	109	26-Oct	29	03-Sep
					1,985	15-Oct					179	12-Sep
					1,493	30-Oct					152	25-Sep
1987	12	12-Nov	102	12-Nov	11,103 [b]	01-Oct	24	12-Nov	37	21-Nov	154	15-Oct
					559	29-Oct					315	18-Oct
											49	19-Nov
1988					6,782 [b]	24-Sep	0	23-Aug	0	23-Aug	0	23-Aug
					600	25-Sep						
1989	150 [a]	13-Sep	25	30-Aug	9,930 [b]	02-Oct	0	12-Sep	0	12-Sep	0	12-Sep
1990	53	23-Oct	45	23-Oct	6,222 [b]	26-Sep	60	28-Oct	16	21-Oct	142	21-Oct
					734	20-Oct					187	04-Nov
					1,604	31-Oct						
1991	55	18-Sep	70	18-Sep	8,929 [b]	28-Sep						
1992	2		300		6,535 [b]	07-Oct	0 a	03-Sep	50 [a]	03-Sep	98	22-Oct
1993	145	05-Oct	69	03-Oct	6,813 [b]	30-Sep	83	12-Oct	133	13-Oct	274	18-Oct
											253	31-Oct
1994	1,749	27-Sep	199	28-Sep	8,146 [b]	29-Sep					226	22-Sep
1995					8,694 [b]	01-Oct					521	12-Oct
1996	62	07-Oct	27	07-Oct	8,439 [b]	01-Oct					88	09-Oct
1997	0 [a]	12-Aug	0 [a]	12-Aug	0 [a]	14-Aug	0 a	14-Aug	0 [a]	14-Aug	0 [a]	14-Aug
	199	01-Oct	83	01-Oct	10,926 [b]	06-Oct					594	22-Oct
1998	0 [c]	01-Aug	0 [c]	11-Aug	0 [c]	19-Aug	0 a	01-Aug	0 [c]	01-Aug	0 [c]	01-Aug
	0 [c]	08-Sep	111	28-Sep	9,062 [b]	28-Sep	0 a	08-Sep	0 [c]	08-Sep	0 [c]	08-Sep
	170	28-Sep									153	13-Oct

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Year	American		Olds		Roslyn		Chiniak	
	Count	Date	Count	Date	Count	Date	Count	Date
1980	903	30-Oct	780	28-Oct	628	27-Nov	32	08-Nov
1981	1,130 [a]	13-Oct	800 [a]	13-Oct	360 [a]	13-Oct	170	02-Nov
	627	30-Oct	434	29-Oct	314	22-Oct		
1982	360 [a]	07-Oct	645 [a]	07-Oct	240 [a]	07-Oct	155	25-Oct
	266	28-Oct	1,375	27-Oct	525	25-Oct		
1983	420 [a]	22-Sep	800 [a]	22-Sep	49	21-Oct	25	21-Oct
	114	25-Oct	173	25-Oct				
1984	350 [d]	11-Sep	4,500 [d]	22-Aug	76	06-Nov	76	06-Nov
1985	65 [d]	20-Sep	900 [d]	20-Sep	150 [d]	05-Sep	66	24-Sep
	439	30-Oct	1,648	25-Sep	78 [d]	20-Sep	86	28-Oct
					93	24-Sep		
					189	30-Oct		
1986	99	05-Sep	1,178	05-Sep	358	04-Sep	48	20-Oct
	201	15-Sep	1,849	11-Sep	342	10-Sep		
	221	24-Oct	1,549	17-Oct	370	19-Sep		
			1,164	28-Oct	306	25-Sep		
1987	555	19-Oct	842	18-Oct	280	14-Sep	15	09-Nov
	453	14-Nov	683	14-Nov	0	18-Oct		
					47	09-Nov		
1988			0	23-Aug				
1989	2,500 [a]	13-Sep	800 [a]	13-Sep	222	16-Sep		
			769	28-Oct	335	25-Oct		
1990	20	06-Sep	15	06-Sep	40	06-Sep	48	05-Nov
	419	19-Oct	1,706	17-Oct	648	16-Oct		
	290	27-Oct	1,014	03-Nov	676	30-Oct		
	316	06-Nov						
1991			900 [a]	06-Sep	50 [a]	22-Aug		
			570	09-Sep	882	04-Oct		
1992	600 [a]	21-Sep	950 [a]	21-Sep	100 [a]	03-Sep		
	181	20-Oct	320	18-Oct	70	21-Oct		
1993	412	20-Oct	525	05-Oct	148	15-Oct		
			474	31-Oct	137	22-Oct		
1994	194	06-Oct	243	14-Oct	130	21-Oct		
			395	21-Oct				
1995	4,000 [d]	08-Sep	7,500 [d]	08-Sep	322	12-Oct		
	169	10-Oct	2,642	11-Oct				
1996	69	04-Oct	2,200	04-Oct	6	09-Oct		
	62	09-Oct	2,086	14-Oct				
1997	0 [a]	18-Aug	0 [a]	07-Aug	0 [a]	12-Aug	0 [a]	12-Aug
	1,467	01-Oct	0 [a]	12-Aug	1,043	02-Oct	16	22-Oct
	940	09-Oct	0 [a]	14-Aug				
	2,204	24-Oct	3,380	04-Oct				
	2,450 [a]	31-Oct	3,779	10-Oct				
			4,064	22-Oct				
1998	0 [a]	01-Aug	0 [a]	31-Jul	0 [a]	11-Aug	0 [a]	11-Aug
	14	08-Sep	0 [a]	11-Aug	57	20-Oct	31	20-Oct
	33	13-Sep	1,033	08-Sep				
	80	14-Sep	2,296	02-Oct				
	621	02-Oct	1,133	20-Oct				
	534	08-Oct						
	1,360	21-Oct						
	832	27-Oct						

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Year	Pasagshak		Saltery		Miam		Hurst	
	Count	Date	Count	Date	Count	Date	Count	Date
1980	850	23-Aug	212 [a]	07-Nov	200 [a]	23-Aug	218	31-Oct
	1,330	20-Oct						
	1,330	20-Nov						
1981	320 [a]	21-Oct	720 [a]	21-Oct	300 [a]	22-Aug		
			959	05-Nov	740 [a]	21-Oct		
1982	175	27-Oct	400 [a]	07-Oct	220	07-Oct	266	02-Nov
			2,176	02-Nov				
1983	1,500 [a]	23-Aug	700 [a]	09-Sep	500 [a]	31-Aug	48	15-Nov
	1,920	28-Oct			20 [a]	07-Sep		
1984	1,540	01-Nov	2,100 [a]	10-Sep	1,000 [a]	10-Sep	50 [a]	10-Sep
			520 [a]	06-Oct	1,050 [a]	16-Oct	339	08-Nov
1985	400 [a]	06-Sep	4,022 [b]	28-Sep	160	06-Sep	55 [a]	20-Sep
	3,000 [a]	29-Oct			1,060 [a]	20-Sep		
					1,500 [a]	04-Oct		
1986	1,998	14-Oct	11,009 [b]	12-Sep			427	28-Oct
	3,524	22-Oct						
	3,571	29-Oct						
1987	1,023	18-Oct	11,376 [b]	01-Oct				
	2,519	13-Nov						
1988	2,000 [a]	23-Aug	4,702 [b]	12-Sep	250 [a]	30-Aug		
1989	800 [a]	12-Sep	5,332 [b]	26-Sep	1,400 [a]	13-Sep	0 [a]	12-Sep
	1,800 [a]	13-Sep						
1990	303	15-Oct	2,847 [b]	17-Sep			372	29-Oct
	908	28-Oct	268	29-Oct				
	2,178	15-Nov						
			187	04-Nov				
1991	0	05-Oct	747 [b]	04-Sep	300 [a]	30-Aug		
					3,500 [a]	06-Sep		
1992	3,000 [a]	03-Sep	1,000 [a]	21-Sep	1,300 [a]	21-Sep		
	5	19-Oct						
1993	612	25-Oct	3,500 [a]	13-Sep	4,700 [a]	13-Sep		
	1,337	06-Nov						
1994	-		2,173 [b]	22-Sep	-	-		
1995	-		6,500 [a]	08-Sep	2,500 [a]	08-Sep		
1996	48	10-Oct						
	1,973	05-Nov						
	789	18-Nov						
1997			0 [a]	19-Aug	0 [a]	23-Jul	0 [a]	19-Aug
	0 [a]	07-Aug	1,500 [a]	10-Sep	1,500 [a]	10-Sep		
	2,813	12-Nov						
1998	1,906	05-Nov	67 [b]	31-Aug	0 [a]	31-Jul	0 [a]	08-Sep
	1,917	13-Nov	0 [a]	04-Sep	0 [a]	11-Aug		
			1200 a	08-Sep				

Note: All unmarked counts were documented on foot surveys.

[a] Aerial survey counts.

[b] Weir counts.

APPENDIX F

Appendix F1.-Pink salmon peak escapement counts for streams along the Kodiak road system, 1980-1998.

	Monashka		Pillar		Buskin[a]		Sargent		Russian		Salonie		American	
Year	Count	Date	Count	Date	Count	Date	Count	Date	Count	Date	Count	Date	Count	Date
1980	3,300	25-Aug	30	25-Aug	95,000	20-Aug	2,800	20-Aug	8,000	20-Aug	3,000	20-Aug	47,000	23-Aug
1981	1,300	26-Aug	400	26-Aug	70,000	28-Aug	1,400	22-Aug	5,600	22-Aug	10,000	22-Aug	45,000	22-Aug
1982	2,800	01-Sep	277	17-Sep	120,000	27-Aug	10,000	27-Aug	8,000	11-Aug	12,000	27-Aug	36,000	27-Aug
1983	1,100	31-Aug	420	31-Aug	53,000	23-Aug	300	11-Aug	2,000	23-Aug	5,500	23-Aug	64,000	07-Sep
1984	4,600	03-Aug	500	31-Jul	100,000	11-Sep	1,800	11-Sep	6,000	10-Aug	2,800	11-Sep	30,000	28-Aug
1985	8,500	05-Sep	5,040	11-Sep	153,026 [b]		4,000	05-Sep	10,400	05-Sep	20,400	05-Sep	140,000	20-Sep
1986	5,500	09-Sep	6,215	09-Sep	98,958 [b]		3,500	18-Aug	14,000	18-Aug	18,000	18-Aug	21,000	18-Aug
1987	225	21-Jul	300	17-Aug	27,892 [b]		300	25-Aug	18,200	25-Aug	1,000	25-Aug	112,000	25-Aug
1988	2,000	15-Aug	1,000	15-Aug	203,648 [b]		19,000	23-Aug	12,000	23-Aug	15,000	23-Aug	500	25-Jul
1989	8,000	30-Aug	42,100	27-Aug	159,123 [b]		22,000	12-Sep	36,500	12-Sep	113,000	12-Sep	126,000	25-Sep
1990	2,700	14-Aug	11,580	20-Aug	42,889 [b]		4,900	18-Aug	4,180	18-Aug	4,140	18-Aug	22,000	21-Aug
1991	7,800	30-Aug	6,000	30-Aug	37,736 [c]		250	02-Aug	900	12-Aug	9,000	22-Aug	49,000	22-Aug
1992	7,700	07-Sep	11,900	07-Sep	25,141 [c]		1,240	03-Sep	2,700	03-Sep			17,900	03-Sep
1993	3,600	17-Aug	6,200	17-Aug	53,484 [c]		14,500	09-Aug	17,500	09-Aug	52,500	09-Aug	52,700	10-Sep
1994	7,000	02-Sep	17,000	02-Sep	89,711 [c]		10,000	05-Aug	8,500	02-Aug	300	22-Sep	95,000	11-Aug
1995	7,000	16-Aug	20,000	16-Aug	72,826 [c]		13,500	18-Aug	140,000	18-Aug	194,500	18-Aug	142,000	08-Sep
1996	4,850	15-Aug	8,000	15-Aug	50,550 [c]		3,000	08-Aug	9,000	08-Aug	17,000	08-Aug	33,000	15-Aug
1997	9,700	12-Aug	2,500	12-Aug	47,396 [c]		10,000	14-Aug	18,000	14-Aug	18,000	14-Aug	85,000	18-Aug
1998	2,500	01-Aug	16,800	08-Sep	134,403 [c]		21,000	01-Aug	40,900	08-Sep	36,900	08-Sep	60,500	08-Sep

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	Olds		Roslyn		Chiniak		Pasagshak		Saltery		Miam		Hurst	
Year	Count	Date	Count	Date	Count	Date	Count	Date	Count	Date	Count	Date	Count	Date
1980	67,700	08-Aug	52,000	23-Aug	5,500	20-Aug			38,000	23-Aug	16,000	03-Aug	10,000	08-Aug
1981	40,000	22-Aug	1,500	25-Jul	650	27-Jul	2,000	04-Aug	57,000	04-Aug	12,280	22-Aug	6,000	22-Aug
1982	60,000	27-Aug	30,000	27-Aug	4,500	25-Aug			25,000	27-Aug	20,000	17-Aug	5,000	27-Aug
1983	27,000	23-Aug	2,800	07-Sep	3,000	23-Aug	400	31-Jul	28,000	09-Sep	16,000	31-Aug	3,500	23-Aug
1984	31,500	22-Aug	17,000	31-Aug	11,000	31-Aug	3,500	27-Aug	28,000	28-Aug	21,000	27-Aug	1,000	27-Aug
1985	65,000	05-Sep	7,800	05-Sep	9,700	06-Sep	11,000	06-Aug	26,000	10-Jul	39,800	06-Aug	1,500	27-Aug
1986	52,000	16-Aug	27,000	18-Aug	7,000	18-Aug			23,011 [d]		19,000	18-Aug	9,000	18-Aug
1987	48,100	25-Aug	12,000	25-Aug	9,400	10-Aug	2,000	12-Aug	39,687 [d]		19,800	12-Aug	11,100	25-Aug
1988	90000	23-Aug	42000	23-Aug			2,000	23-Aug	7,646 [d]		8,000	30-Aug	5,600	30-Aug
1989	46,000	30-Aug	39,400	30-Aug			2,000	13-Sep	214,541 [d]		40,000	11-Sep	96,000	26-Aug
1990	21,000	13-Aug	39,450	18-Aug	22,550	18-Aug			313 [d]		9,970	14-Aug	6,700	20-Aug
1991	22,500	12-Aug	23,000	22-Aug	10,000	02-Aug	2,000	06-Sep	34,087 [d]		43,000	06-Sep	15,450	22-Aug
1992	24,500	03-Sep	9,400	08-Aug	4,500	03-Sep	500	03-Sep	5,800	16-Aug	4,400	03-Sep	3,800	08-Aug
1993	58,000	05-Aug	21,000	05-Aug	74,000	05-Aug	300	15-Jul	92,078 [d]		25,000	23-Aug		
1994	78,500	11-Aug	24,000	09-Aug	24,000	09-Aug	500	01-Aug	16,664	11-Aug	11,400	11-Aug		
1995	130,000	08-Sep	30,500	18-Aug	28,000	18-Aug	4,600	04-Aug	85,000	08-Sep	60,300	09-Sep	31,500	06-Aug
1996	11,000	15-Aug	15,500	08-Aug	30,000	08-Aug			4,500	08-Aug	1,600	15-Aug		
1997	55,000	10-Sep	6,000	12-Aug	35,000	12-Aug	1,500	07-Aug	31,358	19-Aug	34,000	10-Sep	18,500	19-Aug
1998	42,000	08-Sep	43,500	11-Aug	70,000	11-Aug	7,500	08-Sep	15,500	04-Sep	19,000	04-Sep	3,900	08-Sep

Note: Unless otherwise noted, these figures represent the largest aerial survey count of the year, not an estimate of total escapement. Dates for surveys are provided because during some years a stream may only be flown once, possibly before or after the run has started. In these cases the dates will show that the low peak count was due to the date it was flown and not necessarily the low abundance of fish.

[a] 1985-1998 are weir counts.

[b] Does not include an estimated 18,000; 12,000; 2,500; 30,000; 28,000; and 11,563 salmon spawning below the weir in 1985, 1986, 1987, 1988, 1989, and 1990, respectively.

[c] The weir was not operated during late July and early August. Pink salmon counts have been supplemented with aerial surveys in order to estimate escapement.

[d] Weir counts.

Appendix F2.-Sockeye salmon peak escapement counts for streams along the Kodiak road system, 1980-1998.

	Buskin[a]		Pasagshak		Saltery		Miam	
Year	Count	Date	Count	Date	Count	Date	Count	Date
1980	3,814	15-Aug	3,484	19-Aug	31,600	03-Aug	300	13-Jul
1981	7,846	14-Aug	2,759	26-Aug	43,300	04-Aug		
1982	3,600	27-Aug	5400	27-Aug	28,000	26-Jul	200	27-Aug
1983	4,669	30-Aug	3458	02-Sep	46,400	10-Aug	800	10-Aug
1984	4,875	11-Sep	3,700	13-Aug	120,000	20-Jul	1,500	29-Jul
1985	18,010		1,700	04-Sep	26,000	10-Jul		
1986	8,939		3,200	18-Aug	38,314 [b]			
1987	12,690		14,000	12-Aug	22705 [b]		700	25-Aug
1988	12,144		20,000	23-Aug	25,654 [b]		1,200	30-Aug
1989	17,853		14,300	13-Sep	30,937 [b]		950	12-Sep
1990	10,528		4,680	28-Sep	29,541 [b]		1,900	13-Aug
1991	9,789		25,000	30-Aug	52,577 [b]		2,300	30-Aug
1992	9,782		3,590	03-Sep	44,450	03-Sep	270	05-Aug
1993	9,526		16,000	15-Jul	77,186 [b]		1,200	23-Aug
1994	11,783		2,400	01-Aug	58,975 [b]		800	08-Aug
1995	15,520		12,500	30-Jul	43,859 [b]		2,000	27-Jul
1996	9,661		21,500	26-Jul	35,488 [b]		3,200	31-Jul
1997	9,840		13,200	07-Aug	31,016 [b]		3,000	23-Jul
1998	14,767		1,850	08-Sep	26,263 [b]		650	11-Aug

Note: These figures represent the largest aerial survey count of the year, not an estimate of total escapement. Dates for surveys are provided because during some years a stream may only be flown once, possibly before or after the run has started. In these cases the dates will show that the low peak count was due to the date it was flown and not necessarily the low abundance of fish.

[a] 1985-1998 are weir counts. From 1990-1998 the weir was located upriver at the outlet of Buskin Lake during the sockeye immigration. Sockeye entering the tributary lakes of Louise and Genevieve are not counted at the upriver location.

[b] Weir counts.

Appendix F3.-Chum salmon peak escapement counts for streams along the Kodiak road system, 1980-1998.

	Sargent		Russian		Salonie		American		Olds		Roslyn		Saltery[a]	
Year	Count	Date	Count	Date	Count	Date	Count	Date	Count	Date	Count	Date	Count	Date
1980			4,000	20-Aug	1,400	20-Aug	4,000	01-Sep	8,500	23-Aug				
1981			500	22-Aug	200	22-Aug	2,500	22-Aug	500	22-Aug			7,000	04-Aug
1982	1,500	27-Aug	2,000	11-Aug	1,000	11-Aug	3,000	11-Aug	2,500	27-Aug			8,000	31-Aug
1983	50	11-Aug	500	23-Aug	2,000	23-Aug	10,000	07-Sep	11,000	07-Sep			5,000	23-Aug
1984	100	11-Sep	4,800	11-Sep	1,100	11-Sep	8,400	11-Sep	15,000	28-Aug			10,000	03-Aug
1985	2,500	05-Sep	7,600	05-Sep	10,000	20-Sep	10,400	05-Sep	8,000	22-Aug			43	
1986			4,000	18-Aug	5,000	18-Aug	4,000	18-Aug	3,000	16-Aug			203	
1987			10,000	15-Sep			800	12-Aug	2,600	12-Aug			121	
1988			8,000	23-Aug	500	23-Aug			15000	23-Aug			28	
1989			1,800	12-Sep			11,000	25-Sep	1,400	13-Sep	200	30-Aug	14	
1990			200	18-Aug			8,000	13-Aug	1,400	18-Aug			9	
1991							12,000	22-Aug	2,500	02-Aug			18	
1992			2,365	03-Sep			4,500	03-Sep	3,000	08-Aug	123	14-Aug	250	
1993			700	09-Aug			2,000	10-Sep	7,000	17-Aug	700	05-Aug	5,000	13-Sep
1994							5,100	11-Aug	5,000	11-Aug			500	08-Aug
1995					300	18-Aug	8,000	08-Sep	1,500	31-Jul			103	08-Aug
1996							2,500	15-Aug	600	31-Jul				
1997			2,000	14-Aug			15,000	18-Aug	2,000	07-Aug			29	06-Sep
1998					810	08-Sep	1,200	08-Sep	1,000	31-Jul			34	31-Aug

Note: These figures represent the largest aerial survey count of the year, not an estimate of total escapement. Dates for surveys are provided because during some years a stream may only be flown once, possibly before or after the run has started. In these cases the dates will show that the low peak count was due to the date it was flown and not necessarily the low abundance of fish.

[a] 1985-1992 are weir counts. Does not include fish spawning below the weir.

APPENDIX G

Appendix G1.-Immigration of sockeye salmon through the Buskin River weir, 1989-1998.

	1989		1990 [a]		1991		1992		1993		1994		1995		1996		1997		1998		1989-98
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
20-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-May	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-May	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-May	1	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-May	11	0	1	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-May	25	0	1	0	20	0	7	0	0	0	0	0	34	0	0	0	0	0	0	0	0
28-May	65	0	16	0	35	0	7	0	0	0	0	0	34	0	0	0	0	0	0	0	0
29-May	72	0	16	0	35	0	7	0	0	0	0	0	34	0	99	1	93	1	0	0	0
30-May	106	1	16	0	154	2	7	0	18	0	0	0	34	0	213	2	217	2	154	1	1
31-May	133	1	17	0	154	2	7	0	69	1	0	0	34	0	232	2	227	2	506	3	1
01-Jun	147	1	17	0	165	2	11	0	87	1	0	0	36	0	334	3	280	3	580	4	1
02-Jun	197	1	17	0	321	3	11	0	297	3	5	0	42	0	596	6	395	4	782	5	2
03-Jun	297	2	28	0	902	9	12	0	530	6	188	1	283	2	866	8	673	7	1190	8	4
04-Jun	447	3	735	2	912	9	12	0	922	11	440	3	1023	7	1127	11	1,139	12	1304	9	7
05-Jun	623	3	983	3	912	9	121	1	1,370	16	595	5	2,085	14	1,393	14	1,260	13	1606	11	9
06-Jun	863	5	1,918	5	1,218	12	142	1	1,514	17	750	6	2,782	18	1,642	16	1,531	16	1981	13	11
07-Jun	1,258	7	2,049	6	1,265	13	601	6	1,558	18	1,399	11	3,038	20	2,077	20	2,171	22	3214	22	14
08-Jun	2,040	11	2,492	7	1,380	14	623	6	2,160	25	1,704	13	3,708	24	2,429	24	2,382	24	3414	23	17
09-Jun	2,655	15	2,829	8	1,478	15	760	8	2,394	27	1,822	14	4,526	29	2,615	25	2,622	27	4094	28	20
10-Jun	2,861	16	2,937	8	1,844	19	1,722	18	2,577	29	1,949	15	4,698	30	2,879	28	2,747	28	4367	30	22
11-Jun	3,752	21	3,178	9	2,469	25	1,758	18	2,885	33	2,056	16	5,342	35	3,975	39	2,937	30	5238	35	26
12-Jun	3,937	22	3,527	10	2,710	28	2,002	21	3,377	38	2,406	18	5,848	38	4,446	43	3,174	32	5625	38	29
13-Jun	4,153	23	3,999	11	3,431	35	2,515	26	3,878	44	2,758	21	6,819	44	4,703	46	5,040	51	5828	39	34
14-Jun	4,627	26	4,335	12	4,135	42	2,531	26	3,944	45	3,094	24	7,537	49	4,826	47	5,528	56	6093	41	37
15-Jun	4,934	28	4,631	13	4,730	48	2,876	29	3,965	45	3,366	26	8,590	56	4,909	48	5,867	60	6270	42	40
16-Jun	5,537	31	4,860	14	4,744	48	2,963	30	4,257	49	3,835	29	8,740	57	4,995	49	5,896	60	7077	48	41
17-Jun	6,550	37	5,140	15	4,794	49	2,988	31	4,610	53	3,956	30	9,312	60	5,147	50	6,239	63	7674	52	44
18-Jun	6,770	38	5,252	15	5,025	51	3,251	33	4,809	55	4,343	33	10,013	65	6,001	58	6,333	64	7979	54	47

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	1989		1990 [a]		1991		1992		1993		1994		1995		1996		1997		1998		1987-96
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
19-Jun	6,779	38	5,504	52	5,255	54	3,599	37	5,186	59	4,955	38	10,590	69	6,503	63	6,465	66	8340	56	53
20-Jun	7,000	39	5,648	54	5,485	56	3,891	40	5,344	61	5,745	44	11,843	77	6,602	64	6,515	66	8729	59	56
21-Jun	7,500	42	5,907	56	5,715	58	4,042	41	5,603	64	6,875	52	12,079	78	6,673	65	7,166	73	8917	60	59
22-Jun	7,732	43	6,056	58	5,856	60	4,380	45	5,750	66	7,242	55	12,286	80	6,724	66	7,344	75	9115	62	61
23-Jun	7,900	44	6,292	60	5,914	60	5,230	54	5,828	66	7,599	58	12,398	80	6,781	66	7,440	76	10258	69	63
24-Jun	8,304	47	6,444	61	6,080	62	5,264	54	6,081	69	8,282	63	12,933	84	7,075	69	7,475	76	10489	71	66
25-Jun	8,784	49	6,852	65	6,194	63	5,466	56	6,257	71	8,415	64	12,989	84	7,075	69	7,545	77	10610	72	67
26-Jun	9,184	51	7,010	67	6,368	65	5,595	57	6,350	72	8,643	66	12,989	84	7,126	69	7,656	78	11126	75	69
27-Jun	9,490	53	7,050	67	6,413	65	5,927	61	6,526	74	8,874	68	13,044	85	7,154	70	7,834	80	11683	79	70
28-Jun	9,830	55	7,122	68	6,473	66	6,750	69	6,615	75	9,035	69	13,113	85	7,172	70	7,871	80	11721	79	72
29-Jun	10,173	57	7,125	68	6,510	66	6,841	70	6,633	76	9,164	70	13,322	86	7,310	71	7,884	80	12097	82	73
30-Jun	10,436	58	7,559	72	6,638	68	6,887	71	6,648	76	9,187	70	13,583	88	8,082	79	7,911	80	12254	83	74
01-Jul	10,839	61	7,621	72	6,692	68	6,897	71	6,776	77	10,001	76	13,594	88	8,140	79	7,935	81	12369	84	76
02-Jul	11,123	62	7,783	74	7,040	72	7,014	72	6,814	78	10,037	77	13,629	88	8,145	79	8,011	81	13250	90	77
03-Jul	11,277	63	7,893	75	7,184	73	7,042	72	6,855	78	10,341	79	13,701	89	8,151	79	8,018	81	13667	93	78
04-Jul	11,451	64	7,909	75	7,265	74	7,126	73	6,860	78	10,415	79	13,866	90	8,193	80	8,070	82	13667	93	79
05-Jul	11,638	65	7,909	75	7,342	75	7,168	73	6,952	79	10,547	80	13,879	90	8,472	83	8,070	82	13677	93	80
06-Jul	11,720	66	7,913	75	7,402	76	7,205	74	6,953	79	10,648	81	14,067	91	8,793	86	8,076	82	13834	94	80
07-Jul	11,874	67	7,933	75	7,480	76	7,236	74	6,964	79	10,663	81	14,141	92	8,793	86	8,076	82	13905	94	81
08-Jul	12,096	68	7,963	76	7,503	77	7,248	74	6,996	80	10,680	81	14,167	92	8,893	87	8,123	83	13920	94	81
09-Jul	12,521	70	8,201	78	7,599	78	7,319	75	7,016	80	10,718	82	14,175	92	8,939	87	8,123	83	13931	94	82
10-Jul	12,706	71	8,205	78	7,614	78	7,345	75	7,019	80	10,724	82	14,187	92	8,946	87	8,131	83	13931	94	82
11-Jul	12,790	72	8,205	78	7,680	78	7,374	76	7,084	81	11,044	84	14,202	92	8,948	87	8,145	83	13971	95	83
12-Jul	12,841	72	8,205	78	7,688	78	7,414	76	7,151	82	11,151	85	14,260	92	8,958	87	8,145	83	13983	95	83
13-Jul	13,032	73	8,206	78	7,693	79	7,466	77	7,158	82	11,250	86	14,281	93	8,971	87	8,145	83	14011	95	83
14-Jul	13,062	73	8,341	79	7,707	79	7,527	77	7,203	82	11,275	86	14,283	93	8,973	87	8,145	83	14031	95	83
15-Jul	13,676	77	8,381	80	7,748	79	7,585	78	7,315	83	11,276	86	14,325	93	8,973	87	8,159	83	14057	95	84
16-Jul	13,931	78	8,413	80	7,825	80	7,597	78	7,337	84	11,299	86	14,603	95	8,973	87	8,159	83	14059	95	85
17-Jul	14,041	79	8,653	82	7,831	80	7,598	78	7,583	86	11,405	87	14,634	95	9,016	88	9,084	92	14062	95	86
18-Jul	14,259	80	8,653	82	7,956	81	7,684	79	7,628	87	11,483	88	14,637	95	9,106	89	9,121	93	14062	95	87

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	1989		1990 [a]		1991		1992		1993		1994		1995		1996		1997		1998		1987-96
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
19-Jul	14,423	81	8,668	82	7,961	81	7,845	80	7,630	87	11,597	88	14,641	95	9,106	89	9,220	94	14066	95	87
20-Jul	14,499	81	8,718	83	7,977	81	7,874	81	7,630	87	11,599	88	14,641	95	9,144	89	9,226	94	14447	98	88
21-Jul	14,797	83	8,803	84	8,004	82	7,907	81	7,630	87	11,600	88	14,642	95	9,264	90	9,237	94	14617	99	88
22-Jul	14,898	83	8,899	85	8,033	82	7,938	81	7,642	87	11,602	89	14,642	95	9,266	90	9,237	94	14628	99	89
23-Jul	15,168	85	8,917	85	8,164	83	8,019	82	7,653	87	11,605	89	14,642	95	9,270	90	9,240	94	14632	99	89
24-Jul	15,420	86	8,935	85	8,227	84	8,204	84	7,656	87	11,605	89	14,645	95	9,463	92	9,247	94	14632	99	90
25-Jul	15,531	87	8,954	85	8,254	84	8,253	85	7,708	88	11,605	89	14,671	95	9,468	92	9,255	94	14632	99	90
26-Jul	15,650	88	8,957	85	8,307	85	8,268	85	7,720	88	11,605	89	14,673	95	9,475	92	9,269	94	14638	99	90
27-Jul	15,692	88	9,008	86	8,360	85	8,315 [b]	85	7,721	88	11,606	89	14,674	95	9,476	92	9,290	94	14640	99	90
28-Jul	15,789	88	9,299	88	8,413	86	8,362	86	7,741	88	11,607	89	14,674	95	9,477	92	9,290	94	14659	99	91
29-Jul	15,911	89	9,386	89	8,466	86	8,409	86	7,807	89	11,679 [c]	89	14,674	95	9,477	92	9,495	96	14659	99	91
30-Jul	16,211	91	9,424	90	8,519	87	8,456	87	7,848 [d]	89	11,751	90	14,682	95	9,514 [e]	93	9,495	96	14659	99	92
31-Jul	16,326	91	9,475	90	8,572	88	8,503	87	7,889	90	11,823	90	14,687	95	9,551	93	9,495	96	14659	99	92
01-Aug	16,472	92	9,755	93	8,625	88	8,550	88	7,930	90	11,895	91	14,729 [f]	96	9,588	93	9,495	96	14659	99	93
02-Aug	16,521	93	9,812	93	8,678	89	8,597	88	7,971	91	11,967	91	14,771	96	9,625	94	9,495	96	14659	99	93
03-Aug	16,743	94	9,973	95	8,731	89	8,644	89	8,012	91	12,039	92	14,813	96	9,662	94	9,495	96	14659	99	94
04-Aug	16,766	94	10,033	95	8,784	90	8,691	89	8,053	92	12,111	92	14,855	96	9,699	95	9,495	96	14659	99	94
05-Aug	16,868	94	10,082	96	8,837	90	8,738	90	8,094	92	12,183	93	14,897	97	9,736	95	9,495	96	14659	99	94
06-Aug	16,940	95	10,137	96	8,890	91	8,785	90	8,135	93	12,255	93	14,939	97	9,773	95	9,495	96	14659	99	95
07-Aug	17,029	95	10,196	97	8,942	91	8,832	91	8,176	93	12,327	94	14,981	97	9,810	96	9,495	96	14659	99	95
08-Aug	17,154	96	10,249	97	8,994	92	8,879	91	8,217	94	12,399	95	15,023	97	9,847	96	9,495	96	14659	99	95
09-Aug	17,219	96	10,290	98	9,046	92	8,926	91	8,258	94	12,471	95	15,065	98	9,884	96	9,495	96	14659	99	96
10-Aug	17,262	97	10,326	98	9,098	93	8,973	92	8,299	95	12,543	96	15,107	98	9,921	97	9,495	96	14659	99	96
11-Aug	17,317	97	10,381	99	9,150	93	9,020	92	8,340	95	12,615	96	15,149	98	9,958	97	9,495	96	14659	99	96
12-Aug	17,389	97	10,414	99	9,202	94	9,067	93	8,381	96	12,687	97	15,191	98	9,995	97	9,495	96	14659	99	97
13-Aug	17,421	98	10,433	99	9,254	94	9,114	93	8,422	96	12,759	97	15,233	99	10,032	98	9,495	96	14659	99	97
14-Aug	17,470	98	10,452	99	9,306	95	9,161	94	8,463	96	12,831	98	15,273 [f]	99	10,076 [e]	98	9,495	96	14659	99	97
15-Aug	17,519	98	10,468	99	9,358	96	9,208	94	8,504	97	12,903	98	15,282	99	10,092	98	9,513	97	14663	99	98
16-Aug	17,663	99	10,479	100	9,410	96	9,255	95	8,545	97	12,970 [c]	99	15,282	99	10,110	99	9,522	97	14663	99	98
17-Aug	17,676	99	10,482	100	9,462	97	9,302	95	8,586	98	12,970	99	15,292	99	10,114	99	9,563	97	14665	99	98
18-Aug	17,704	99	10,482	100	9,514	97	9,349	96	8,627	98	12,972	99	15,309	99	10,126	99	9,581	97	14673	99	98

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	1989		1990 [a]		1991		1992		1993		1994		1995		1996		1997		1998		1987-96
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
19-Aug	17,726	99	10,485	100	9,566	98	9,396	96	8,668	99	12,977	99	15,322	99	10,139	99	9,611	98	14673	99	99
20-Aug	17,733	99	10,486	100	9,618	98	9,443	97	8,717 [d]	99	12,981	99	15,333	99	10,154	99	9,624	98	14677	99	99
21-Aug	17,741	99	10,486	100	9,670	99	9,490	97	8,717	99	12,987	99	15,351	100	10,195	99	9,652	98	14685	99	99
22-Aug	17,747	99	10,486	100	9,722	99	9,537	98	8,718	99	12,988	99	15,366	100	10,217	100	9,698	99	14685	99	99
23-Aug	17,749	99	10,487	100	9,730	99	9,584	98	8,718	99	12,995	99	15,368	100	10,225	100	9,702	99	14699	100	99
24-Aug	17,749	99	10,487	100	9,732	99	9,631	99	8,718	99	12,997	99	15,377	100	10,227	100	9,708	99	14702	100	99
25-Aug	17,775	100	10,487	100	9,750	100	9,688 [b]	99	8,725 [g]	99	13,002	99	15,386	100	10,234	100	9,718	99	14702	100	99
26-Aug	17,782	100	10,487	100	9,754	100	9,693	99	8,732	100	13,006	99	15,391	100	10,235	100	9,729	99	14703	100	99
27-Aug	17,785	100	10,487	100	9,761	100	9,694	99	8,739	100	13,009	99	15,395	100	10,236	100	9,774	99	14703	100	100
28-Aug	17,809	100	10,487	100	9,768	100	9,695	99	8,746	100	13,009	99	15,403	100	10,238	100	9,785	99	14703	100	100
29-Aug	17,810	100	10,487	100	9,769	100	9,697	99	8,753	100	13,009	99	15,404	100	10,239	100	9,788	99	14713	100	100
30-Aug	17,818	100	10,487	100	9,771	100	9,701	99	8,760	100	13,014	99	15,407	100	10,245	100	9,789	99	14739	100	100
31-Aug	17,820	100	10,494	100	9,771	100	9,704	99	8,765 [g]	100	13,018	99	15,408	100	10,247	100	9,798	100	14746	100	100
Season Total	17,853		10,528		9,794		9,759		8,772		13,109		15,423		10,260		9,840		14,767		
Ending Date	02-Oct		30-Sep		30-Sep		07-Oct		27-Sep		29-Sep		16-Sep		24-Sep		10-Oct		30-Sep		

[a] Beginning in 1990 the weir was moved to the outlet at Buskin Lake for June and July. Fish immigrating to tributary lakes (Genevieve and Louise) are no longer counted.

[b] Estimate based on average percent return 1985-1991 divided equally for the days the weir was out (27 July - 25 August).

[c] Estimate based on average percent return 1985-1991 divided equally for the days the weir was out (29 July - 16 August).

[d] Estimate based on average percent return 1985-1991 divided equally for the days the weir was out (30 July - 20 August).

[e] Estimate based on average percent return 1985-1991 divided equally for the days the weir was out (30 July - 14 August).

[f] Estimate based on average percent return 1985-1991 divided equally for the days the weir was out (1 August - 14 August).

[g] Estimate based on average percent return 1985-1991 divided equally for the days the weir was out (25 August - 31 August).

Appendix G2.-Immigration of pink salmon through the Buskin River weir, 1985-1990.

	1985		1986		1987		1988		1989		1990		1985-90
Date	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	Avg. %
20-Jul	1,885	1	742	1	108	0	215	0	600	0	44	0	0
21-Jul	2,696	2	946	1	143	1	315	0	884	1	536	1	1
22-Jul	3,507	2	1,174	1	247	1	562	0	1041	1	605	1	1
23-Jul	4,341	3	1,505	2	277	1	795	0	1383	1	626	2	2
24-Jul	6,259	4	1,612	2	323	1	1,110	1	2033	1	678	2	2
25-Jul	7,084	5	1,971	2	477	2	1,754	1	2648	2	743	2	2
26-Jul	8,591	6	2,302	2	604	2	2,539	1	4615	3	751	2	3
27-Jul	11,394	7	2,588	3	763	3	3,494	2	6254	4	896	2	3
28-Jul	13,787	9	3,530	4	941	3	4,683	2	9150	6	1,833	4	5
29-Jul	17,650	12	4,159	4	1,287	5	8,142	4	13169	8	2,591	6	6
30-Jul	22,116	15	5,222	5	2,014	7	11,486	6	16,556	10	3,320	8	9
31-Jul	24,363	16	6,679	7	3,258	12	17,442	9	19,346	12	3,617	8	11
1-Aug	25,217	17	7,576	8	4,752	17	23,632	12	24,346	15	4,348	10	13
2-Aug	30,196	20	9,252	9	5,616	20	34,693	17	27,776	18	5,770	14	16
3-Aug	42,604	28	14,658	15	6,994	25	46,631	23	34,573	22	7,192	17	22
4-Aug	54,018	35	17,970	18	8,111	29	62,144	31	39,103	25	8,614	20	26
5-Aug	64,523	42	22,236	23	9,037	32	72,327	36	46,383	29	10,036	23	31
6-Aug	75,544	50	25,812	26	9,818	35	83,068	41	55,848	35	11,458	27	36
7-Aug	83,174	54	29,557	30	10,746	39	104,004	51	65,128	41	12,880	30	41
8-Aug	88,566	58	33,503	34	11,439	41	113,334	56	73,423	46	14,302	33	45
9-Aug	97,014	63	37,651	38	12,210	44	129,929	64	82,283	52	15,724	37	50
10-Aug	106,269	70	40,484	41	12,871	46	143,643	71	89,529	56	17,146	40	54
11-Aug	110,618	72	48,508	49	15,006	54	151,624	75	91,733	58	18,568	43	59
12-Aug	116,456	76	53,571	54	16,214	58	157,449	77	95,984	60	19,990	47	62
13-Aug	120,075	79	56,314	57	16,945	61	162,002	80	98,984	62	21,412	50	65
14-Aug	122,958	80	57,889	59	17,339	62	165,859	82	102,280	64	22,834	53	67
15-Aug	125,903	82	60,897	62	17,553	63	168,933	83	105,612	66	24,256	57	69
16-Aug	127,214	83	61,924	63	17,804	64	173,405	85	111,225	70	25,908	60	71
17-Aug	128,122	84	62,705	63	18,065	65	182,537	90	114,120	72	26,459	62	73
18-Aug	128,932	84	65,193	66	18,294	66	184,808	91	126,176	79	27,610	64	75

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	1985		1986		1987		1988		1989		1990		1985-90
Date	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	Avg. %
19-Aug	129,751	85	65,730	66	18,640	67	185,785	91	132,550	83	28,712	67	77
20-Aug	129,990	85	65,910	67	19,121	69	188,096	92	134,700	85	29,194	68	78
21-Aug	130,524	85	66,135	67	19,530	70	190,966	94	136,100	86	29,388	69	78
22-Aug	132,593	87	66,712	67	19,935	72	191,457	94	137,235	86	29,906	70	79
23-Aug	133,019	87	67,777	69	20,295	73	192,233	94	138,139	87	30,096	70	80
24-Aug	133,285	87	68,342	69	21,151	76	192,946	95	139,593	88	30,422	71	81
25-Aug	133,670	87	70,415	71	21,648	78	194,118	95	143,958	91	31,423	73	83
26-Aug	134,216	88	76,519	77	22,250	80	199,510	98	147,047	92	31,961	75	85
27-Aug	134,874	88	80,710	82	22,449	81	200,099	98	147,872	93	33,059	77	86
28-Aug	135,652	89	81,768	83	22,663	81	200,599	99	148,434	93	33,901	79	87
29-Aug	136,776	89	82,298	83	23,096	83	201,299	99	148,999	94	34,692	81	88
30-Aug	139,361	91	83,655	85	23,498	84	201,899	99	149,968	94	34,833	81	89
31-Aug	140,876	92	85,220	86	23,728	85	202,466	100	151,271	95	35,209	82	91
01-Sep	141,821	93	86,094	87	24,167	87	202,930	100	153,395	96	35,576	83	92
02-Sep	142,709	93	87,062	88	24,721	89	202,930	100	155,278	98	36,097	84	92
03-Sep	144,729	95	87,832	89	25,052	90	202,930	100	155,573	98	38,750	90	94
04-Sep	145,825	95	88,259	89	25,385	91	202,930	100	155,673	98	39,388	92	94
05-Sep	146,706	96	89,557	91	25,658	92	202,930	100	155,963	98	39,765	93	95
06-Sep	147,406	96	91,417	92	26,591	96	203,009	100	156,315	98	39,991	93	96
07-Sep	148,436	97	94,880	96	27,283	98	203,578	100	157,015	99	40,138	94	97
08-Sep	149,411	97	95,101	96	27,313	98	203,578	100	157,413	99	40,970	96	98
09-Sep	149,753	98	95,251	96	27,619	99	203,578	100	158,220	99	41,411	97	98
10-Sep	150,300	98	95,460	97	27,729	99	203,578	100	158,335	100	41,446	97	99
Season Total	153,026		98,958		27,892		203,578		159,123		42,889		114,244
Ending Date	21-Sep		01-Oct		19-Sep		06-Sep		28-Sep		25-Sep		

Note: The Buskin River weir was not operated during the peak pink salmon immigration after 1990.

Appendix G3.-Immigration of coho salmon through the Buskin River weir, 1989-1998.

	1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1987-98
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
01-Aug	0	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
02-Aug	1	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
03-Aug	1	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
04-Aug	1	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
05-Aug	1	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
06-Aug	1	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
07-Aug	2	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
08-Aug	6	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
09-Aug	7	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
10-Aug	10	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
11-Aug	10	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
12-Aug	14	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
13-Aug	16	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0
14-Aug	20	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	13	0	0
15-Aug	25	0	1	0	37 [a]	0	29 [b]	0	21 [c]	0	0	0	23	0	44	1	23	0	77	1	0
16-Aug	35	0	2	0	74	1	58	1	42	1	0	0	27	0	130	2	60	1	113	1	1
17-Aug	44	0	18	0	111	1	87	1	63	1	4	0	56	1	234	3	124	1	151	2	1
18-Aug	71	1	42	1	148	2	116	2	86	1	4	0	95	1	273	3	176	2	237	3	1
19-Aug	105	1	56	1	185	2	145	2	87	1	12	0	113	1	370	4	197	2	269	3	2
20-Aug	133	1	101	2	222	2	174	3	220	3	31	0	135	2	425	5	238	2	385	4	2
21-Aug	148	1	161	3	259	3	203	3	224	3	48	1	172	2	646	8	357	3	463	5	3
22-Aug	159	2	195	3	295	3	232	3	310	4	68	1	208	2	811	10	671	6	508	6	4
23-Aug	171	2	231	4	450	5	261	4	388	6	77	1	236	3	987	12	862	8	633	7	5
24-Aug	185	2	259	4	468	5	288	4	419	6	130	2	269	3	1,035	12	1,006	9	748	8	6
25-Aug	310	3	280	5	493	5	313	5	486	7	144	2	308	4	1,175	14	1,160	11	761	8	6
26-Aug	370	4	340	5	531	6	420	6	553	8	153	2	341	4	1,264	15	1,228	11	780	9	7
27-Aug	381	4	356	6	556	6	507	7	620	9	176	2	370	4	1,450	17	1,376	13	797	9	8
28-Aug	393	4	380	6	605	7	549	8	721	10	185	2	503	6	1,696	20	1,445	13	801	9	9

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	1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1987-96
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
29-Aug	429	4	402	6	668	7	587	9	822	12	191	2	561	6	1,928	23	1,495	14	807	9	9
30-Aug	478	5	428	7	732	8	747	11	923	13	193	2	656	8	2,193	26	1,569	14	822	9	10
31-Aug	519	5	436	7	770	8	906	13	1,024	15	198	2	1,008	12	2,555	30	1,757	16	1,017	11	12
01-Sep	852	9	444	7	787	9	1,087	16	1,116	16	203	2	1,128	13	2,767	33	1,932	18	1,565	17	14
02-Sep	991	10	456	7	947	10	1,158	17	1,209	18	214	3	1,217	14	2,943	35	2,019	18	2,294	25	16
03-Sep	1,041	10	463	7	1,102	12	1,185	17	1,328	19	229	3	1,270	15	3,045	36	2,118	19	2,949	33	17
04-Sep	1,062	11	556	9	1,615	18	1,208	18	1,443	21	235	3	1,819	21	3,117	37	2,246	21	3,117	34	19
05-Sep	1,167	12	853	14	1,857	20	1,230	18	1,558	23	295	4	1,919	22	3,287	39	2,363	22	3,194	35	21
06-Sep	1,231	12	943	15	1,954	21	1,264	19	1,673	24	397	5	2,019	23	4,925	58	2,557	23	3,401	38	24
07-Sep	1,298	13	1,000	16	2,156	23	1,329	19	1,788	26	421	5	2,219	26	5,525	65	2,957	27	3,536	39	26
08-Sep	1,365	14	1,042	17	2,756	30	1,475	22	1,908	28	470	6	2,619	30	5,875	70	3,949	36	3,663	40	29
09-Sep	2,240	23	1,138	18	2,806	30	1,665	24	2,014	29	530	7	3,019	35	6,225	74	4,399	40	3,893	43	32
10-Sep	2,295	23	1,242	20	3,115	34	1,694	25	2,151	31	640	8	3,421	39	6,519	77	4,678	43	4,293	47	35
11-Sep	2,783	28	1,249	20	3,464	38	1,730	25	2,247	33	1,017	12	3,895	45	6,980	83	4,895	45	4,693	52	38
12-Sep	3,133	32	1,301	21	4,071	44	1,781	26	2,545	37	1,635	20	4,270	49	7,254	86	5,047	46	5,051	56	42
13-Sep	3,684	37	1,743	28	4,984	54	1,820	27	2,863	41	1,796	22	4,822	55	7,631	90	5,171	47	5,192	57	46
14-Sep	4,034	41	1,886	30	5,442	59	1,926	28	3,148	46	1,933	24	5,198	60	7,831	93	5,274	48	5,233	58	49
15-Sep	4,814	48	2,222	36	5,900	64	2,001	29	3,265	47	3,526	43	5,665	65	7,931	94	5,799	53	5,255	58	54
16-Sep	5,144	52	2,565	41	6,358	69	2,061	30	4,038	59	4,464	55	5,847	67	7,976 [d]	95	6,299	58	5,284	58	58
17-Sep	5,965	60	3,565	57	6,816	74	3,373	49	4,592	67	4,804	59	6,037	69	8,026	95	6,814	62	5,366	59	65
18-Sep	6,645	67	4,065	65	7,142	77	3,556	52	4,641	67	5,737	70	6,227	72	8,076	96	7,550	69	5,468	60	70
19-Sep	7,645	77	4,565	73	7,426	81	3,602	53	4,773	69	6,090	75	6,417	74	8,126	96	8,389	77	6,647	73	75
20-Sep	8,177	82	4,965	80	7,694	83	3,633	53	5,028	73	6,381	78	6,607	76	8,135	96	8,894	81	7,325	81	78
21-Sep	8,617	87	5,165	83	8,162	88	3,666	54	5,243	76	6,683	82	6,797	78	8,211	97	9,544	87	7,854	87	82
22-Sep	9,074	91	5,365	86	8,229	89	3,671	54	5,327	77	6,985	86	6,987	80	8,247	98	9,869	90	8,086	89	84
23-Sep	9,153	92	5,515	89	8,449	92	3,673	54	5,377	78	7,330	90	7,177	83	8,264	98	9,908	91	8,377	92	86
24-Sep	9,359	94	5,608	90	8,669	94	3,678	54	5,499	80	7,550	93	7,367	85	8,289	98	9,947	91	8,581	95	87
25-Sep	9,516	96	5,830	94	8,836	96	3,698	54	5,782	84	7,731	95	7,557	87	8,314	99	9,986	91	8,690	96	89

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	1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1987-96
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
26-Sep	9,601	97	5,959	96	9,017	98	3,713	54	6,108	89	7,912	97	7,747	89	8,339	99	10,051	92	8,871	98	91
27-Sep	9,651	97	5,959	96	9,163	99	5,481	80	6,383	93	7,966	98	7,937	91	8,364	99	10,077	92	8,929	99	94
28-Sep	9,701	98	6,222	100	9,224	100	5,801	85	6,555	95	8,070	99	8,127	93	8,389	99	10,104	92	8,977	99	96
29-Sep	9,752	98	6,222	100	9,224	100	5,937	87	6,727	98	8,088	99	8,317	96	8,414	100	10,141	93	9,062	100	97
30-Sep	9,805	99	6,222	100	9,224	100	6,108	90	6,899	100	8,146	100	8,507	98	8,439	100	10,342	95	9,062	100	98
01-Oct	9,836	99	6,222	100	9,224	100	6,223	91	6,899	100	8,146	100	8,694	100	8,439	100	10,599	97	9,062	100	99
Season Total	9,930		6,222		9,224 [a]		6,823 [b]		6,899 [c]		8,146		8,694		8,439 [d]		10,926		9,062		

[a] Actual weir not in place until 20 August. Numbers shown are estimates based on historical escapement averages.

[b] Actual weir not in place until 25 August. Numbers shown are estimates based on historical escapement averages.

[c] Actual weir not in place until 21 August. Numbers shown are estimates based on historical escapement averages.

[d] Weir was not put back in for the remainder of 1996, due to record rainfall amounts. Numbers are estimates based on historical escapement averages.

Appendix G4.-Immigration of chinook salmon through the Karluk River weir, 1989-1998.

1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1989-98
N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
0	0	0	0	0	0	0	0	0	0	33	0	41	0	0	0	34	0	0	0	0
0	0	0	0	0	0	0	0	0	0	45	0	45	0	0	0	51	0	1	0	0
0	0	0	0	0	0	0	0	0	0	65	1	58	0	0	0	144	1	1	0	0
0	0	0	0	0	0	0	0	0	0	128	1	103	1	0	0	209	2	1	0	0
4	0	0	0	0	0	0	0	0	0	142	1	160	1	12	0	237	2	58	1	0
12	0	0	0	0	0	0	0	56	0	223	2	166	1	14	0	298	2	116	1	1
30	0	0	0	5	0	0	0	96	1	267	2	238	2	29	0	461	3	230	2	1
62	1	0	0	126	1	1	0	212	2	331	3	260	2	49	0	609	5	396	4	2
87	1	0	0	202	1	28	0	320	2	405	3	318	3	179	2	848	6	562	5	2
130	1	42	0	301	2	63	1	438	3	489	4	328	3	274	3	964	7	595	6	3
165	2	278	2	386	3	89	1	714	5	540	4	366	3	399	4	1105	8	728	7	4
210	2	537	4	478	3	183	2	971	7	635	5	405	3	502	5	1178	9	813	8	5
305	3	646	4	570	4	270	3	1517	11	743	6	529	4	679	7	1421	11	936	9	6
451	4	1090	8	700	5	405	4	1943	14	855	7	754	6	779	8	1831	14	1,112	11	8
524	5	1311	9	1310	9	529	6	2233	16	1204	10	907	7	1006	10	1993	15	1,301	13	10
580	6	1586	11	1545	11	601	6	2559	18	1459	12	1094	9	1180	12	2208	16	1,458	14	12
824	8	1,943	13	1,879	13	818	9	3,206	23	1,835	15	1,290	10	1,457	14	2480	18	1,687	16	14
978	9	2,429	17	2,199	16	985	10	3,405	24	2,000	17	1,491	12	1,713	17	2730	20	1,903	19	16
1,241	12	2,969	21	2,675	19	1,148	12	3,852	28	2,206	18	1,587	13	1,994	20	3265	24	2,138	21	19
1,419	14	3,433	24	3,119	22	1,365	14	4,453	32	2,614	22	1,966	16	2,174	22	3711	28	2,395	23	22
1,705	16	4,456	31	3,744	27	1,699	18	4,917	35	2,869	24	2,305	18	2,402	24	3866	29	2,705	26	25
1,976	19	5,432	38	3,967	28	1,947	20	5,399	39	3,114	26	2,785	22	2,612	26	4155	31	2,997	29	28
2,299	22	5,810	40	4,318	31	2,329	24	5,833	42	3,467	29	3,091	24	2,755	27	4265	32	3,265	32	30
2,555	24	6,631	46	5,160	37	2,857	30	6,187	44	4,198	35	3,534	28	2,985	30	4469	33	3,620	35	34
2,954	28	6,825	47	5,627	40	3,259	34	6,705	48	4,709	39	4,058	32	3,242	32	5030	37	4,000	39	38
3,277	31	7,321	51	5,935	42	3,705	39	7,161	51	5,245	44	4,339	34	4,189	42	5740	43	4,468	44	42
3,591	34	7,598	53	6,350	45	4,093	43	7,411	53	5,774	48	4,885	39	4,419	44	6366	47	4,811	47	45
4,058	39	7,919	55	6,893	49	4,527	47	7,542	54	6,304	52	5,174	41	4,854	48	6861	51	5,190	51	49

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1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1989-98
N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
4,471	43	8,070	56	7,187	51	4,893	51	7,995	57	6,645	55	5,662	45	5,036	50	7270	54	5,432	53	52
5,071	48	8,361	58	7,916	56	5,233	55	8,290	59	6,971	58	6,049	48	5,191	52	7892	59	5,826	57	55
5,477	52	8,949	62	8,449	60	5,609	58	8,935	64	7,143	59	6,495	51	5,465	54	8510	63	6,030	59	58
5,649	54	9,576	66	8,769	63	5,988	62	9,250	66	7,464	62	6,970	55	5,580	56	9353	70	6,828	67	62
6,145	59	10,183	71	9,313	66	5,274	55	9,568	69	7,816	65	7,589	60	6,024	60	9715	72	6,911	67	64
6,749	64	10,820	75	9,753	70	6,542	68	9,965	71	8,194	68	7,859	62	6,565	65	10027	75	7,275	71	69
7,022	67	11,383	79	10,145	72	6,803	71	10,526	75	8,373	69	8,303	66	7,048	70	10287	76	7,380	72	72
7,486	71	11,845	82	10,596	76	6,991	73	10,721	77	8,645	72	8,776	69	7,374	73	10856	81	7,431	73	75
7,799	74	12,210	85	11,001	78	7,184	75	11,008	79	9,014	75	9,105	72	7,651	76	11309	84	7,838	77	77
8,049	77	12,570	87	11,380	81	7,487	78	11,325	81	9,205	76	9,432	75	7,766	77	11404	85	8,117	79	80
8,303	79	12,876	89	11,638	83	7,779	81	11,505	83	9,648	80	9,710	77	8,031	80	11429	85	8,449	83	82
8,477	81	13,075	91	11,892	85	7,968	83	11,668	84	9,835	82	9,875	78	8,160	81	11505	86	8,795	86	84
8,708	83	13,246	92	12,139	87	8,159	85	11,793	85	10,107	84	10,092	80	8,397	84	11547	86	8,856	86	85
9,061	86	13,399	93	12,370	88	8,332	87	11,978	86	10,344	86	10,251	81	8,671	86	11752	87	8,961	88	87
9,260	88	13,579	94	12,560	90	8,475	88	12,184	87	10,427	87	10,672	84	8,696	87	12189	91	9,094	89	88
9,293	89	13,651	95	12,743	91	8,583	89	12,569	90	10,533	87	10,920	86	8,713	87	12409	92	9,239	90	90
9,420	90	13,743	95	12,860	92	8,658	90	12,708	91	10,631	88	11,082	88	8,735	87	12469	93	9,275	91	90
9,511	91	13,808	96	12,962	92	8,744	91	12,845	92	10,767	89	11,265	89	8,791	87	12531	93	9,337	91	91
9,616	92	13,867	96	13,127	94	8,810	92	12,925	93	10,829	90	11,350	90	8,809	88	12565	93	9,438	92	92
9,764	93	13,934	96	13,267	95	8,853	92	13,039	94	10,876	90	11,419	90	8,817	88	12609	94	9,469	92	92
9,818	94	13,966	97	13,323	95	8,929	93	13,146	94	10,923	91	11,509	91	8,818	88	12844	95	9,490	93	93
9,838	94	14,025	97	13,390	95	8,977	94	13,191	95	11,046	92	11,643	92	8,828	88	12905	96	9,588	94	94
9,872	94	14,033	97	13,434	96	8,996	94	13,248	95	11,078	92	11,686	92	8,836	88	12934	96	9,729	95	94
9,904	94	14,044	97	13,484	96	9,023	94	13,302	95	11,138	92	11,839	94	8,842	88	12962	96	9,853	96	94
9,955	95	14,069	97	13,546	97	9,094	95	13,359	96	11,189	93	11,915	94	8,844	88	13041	97	9,901	97	95
10,023	96	14,074	97	13,619	97	9,129	95	13,385	96	11,230	93	11,955	94	8,859	88	13054	97	9,921	97	95
10,045	96	14,081	98	13,646	97	9,141	95	13,408	96	11,276	94	12,006	95	8,860	88	13058	97	9,933	97	95
10,081	96	14,107	98	13,692	98	9,181	96	13,470	97	11,301	94	12,072	95	8,862	88	13065	97	9,942	97	96
10,113	96	14,112	98	13,714	98	9,201	96	13,495	97	11,327	94	12,111	96	8,864	88	13078	97	9,945	97	96
10,145	97	14,130	98	13,733	98	9,215	96	13,532	97	11,347	94	12,144	96	8,880	88	13108	97	9,951	97	96

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1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1989-98
N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
10,168	97	14,145	98	13,746	98	9,241	96	13,547	97	11,355	94	12,183	96	8,904	89	13116	98	9,953	97	96
10,185	97	14,158	98	13,765	98	9,275	97	13,589	97	11,357	94	12,204	96	8,930	89	13123	98	9,955	97	96
10,207	97	14,175	98	13,775	98	9,294	97	13,607	98	11,365	94	12,211	96	8,944	89	13137	98	9,955	97	96
10,215	97	14,203	98	13,785	98	9,309	97	13,623	98	11,367	94	12,239	97	9,357	93	13137	98	9,956	97	97
10,236	98	14,212	98	13,800	98	9,318	97	13,648	98	11,420	95	12,266	97	9,383	93	13151	98	9,984	98	97
10,242	98	14,222	98	13,810	98	9,335	97	13,694	98	11,472	95	12,285	97	9,515	95	13152	98	10,000	98	97
10,261	98	14,240	99	13,820	99	9,341	97	13,728	98	11,538	96	12,298	97	9,602	96	13156	98	10,014	98	97
10,278	98	14,253	99	13,825	99	9,350	97	13,736	99	11,623	96	12,314	97	9,608	96	13233	98	10,044	98	98
10,280	98	14,263	99	13,837	99	9,360	97	13,759	99	11,687	97	12,345	98	9,638	96	13233	98	10,052	98	98
10,280	98	14,281	99	13,849	99	9,371	98	13,765	99	11,697	97	12,375	98	9,650	96	13233	98	10,056	98	98
10,288	98	14,291	99	13,870	99	9,394	98	13,768	99	11,728	97	12,393	98	9,656	96	13234	98	10,059	98	98
10,292	98	14,297	99	13,879	99	9,404	98	13,776	99	11,770	98	12,418	98	9,755	97	13239	98	10,078	98	98
10,298	98	14,305	99	13,889	99	9,433	98	13,788	99	11,777	98	12,472	99	9,796	97	13242	98	10,083	98	98
10,309	98	14,309	99	13,899	99	9,450	98	13,789	99	11,797	98	12,481	99	9,801	98	13243	98	10,094	99	98
10,315	98	14,312	99	13,919	99	9,480	99	13,803	99	11,814	98	12,485	99	9,850	98	13269	99	10,122	99	99
10,329	99	14,316	99	13,920	99	9,499	99	13,827	99	11,823	98	12,489	99	9,886	98	13295	99	10,132	99	99
10,484		14,442		14,022		9,601		13,944		12,049		12,657		10,051		13450		10,239		

Appendix G5.-Immigration of chinook salmon through the Ayakulik River weir, 1989-1998.

	1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1989-98
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
20-May	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
21-May	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	1	0	0
22-May	0	0	0	0	0	0	205	2	0	0	39	0	0	0	0	0	0	0	35	0	0
23-May	0	0	0	0	0	0	361	4	21	0	63	1	0	0	0	0	1	0	67	0	1
24-May	0	0	0	0	0	0	800	9	28	0	88	1	0	0	25	0	12	0	148	1	1
25-May	0	0	0	0	20	0	885	10	37	0	100	1	0	0	65	1	24	0	177	1	1
26-May	0	0	0	0	78	1	1042	11	44	1	129	1	0	0	73	1	34	0	236	2	2
27-May	0	0	800	7	113	1	1351	15	103	1	158	2	2	0	75	1	56	0	422	3	3
28-May	0	0	1318	12	380	3	1588	17	241	3	204	2	11	0	91	1	68	0	604	4	4
29-May	0	0	1709	15	566	4	1699	19	326	4	210	2	22	0	111	1	70	0	732	5	5
30-May	0	0	2137	19	603	5	1836	20	370	5	265	3	29	0	123	1	123	1	848	6	6
31-May	7	0	2409	21	655	5	2012	22	821	11	294	3	41	0	318	3	132	1	1,049	7	7
01-Jun	58	0	3100	28	671	5	2045	22	1927	25	328	4	127	1	622	6	151	1	1,413	10	10
02-Jun	202	1	3797	34	697	5	2385	26	3118	40	568	6	349	2	961	9	215	1	1,858	13	14
03-Jun	255	2	4144	37	711	5	2879	32	3225	41	694	8	532	3	1642	16	316	2	2,170	15	16
04-Jun	387	3	4393	39	772	6	2957	32	3352	43	1304	14	2818	16	1822	18	483	3	2,536	18	19
05-Jun	494	3	4,988	44	961	7	3,030	33	3,585	46	1,565	17	3,602	20	2,020	20	706	5	2,941	21	22
06-Jun	804	5	5,708	51	1,544	12	3,384	37	3,623	46	1,636	18	4,111	23	2,988	29	920	6	3,477	25	25
07-Jun	1,272	8	5,787	51	3,068	24	4,073	45	3,686	47	1,860	20	4,397	25	3,317	32	1,344	9	3,940	28	29
08-Jun	1,408	9	6,659	59	4,164	32	4,273	47	3,708	47	2,731	30	5,167	29	3,404	33	1,429	10	4,347	31	33
09-Jun	1,520	10	6,893	61	5,852	45	4,414	48	3,861	49	3,257	36	5,466	31	3,413	33	1,741	12	4,825	34	36
10-Jun	2,134	14	7,005	62	7,116	55	4,480	49	4,154	53	3,641	40	5,671	32	3,473	34	3,019	21	5,328	38	40
11-Jun	2,967	19	7,157	64	7,714	59	4,624	51	4,537	58	3,797	42	5,936	34	3,511	34	3,978	28	5,799	41	43
12-Jun	4,073	26	7,216	64	8,268	64	4,848	53	4,807	61	4,293	47	6,245	35	3,585	35	4,553	32	6,147	44	46
13-Jun	4,966	32	7,427	66	8,311	64	5,115	56	5,041	64	4,321	47	7,213	41	3,740	36	4,782	33	6,612	47	49
14-Jun	5,580	36	7,433	66	8,728	67	5,261	58	5,160	66	4,544	50	7,470	42	4,080	39	4,905	34	6,840	49	51
15-Jun	6,732	44	7,448	66	8,858	68	5,435	59	5,255	67	4,825	53	7,800	44	4,773	46	5,547	39	7,150	51	54
16-Jun	7,357	48	7,698	68	8,884	68	5,626	62	5,437	70	4,933	54	8,160	46	5,579	54	6,038	42	7,575	54	57

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	1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1989-98
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
17-Jun	8,238	53	7,948	71	9,001	69	5,807	64	5,553	71	5,155	56	8,633	49	6,015	58	6,723	47	7,972	57	59
18-Jun	9,192	60	8,198	73	9,168	71	5,901	65	5,664	72	5,347	59	9,021	51	6,113	59	7,095	49	8,225	59	62
19-Jun	9,218	60	8,448	75	9,259	71	6,085	67	5,834	75	5,461	60	9,368	53	6,161	60	7,428	52	8,585	61	63
20-Jun	10,032	65	8,578	76	9,295	72	6,116	67	5,917	76	5,536	61	9,781	55	6,428	62	7,814	54	8,779	63	65
21-Jun	10,259	66	8,983	80	9,317	72	6,520	71	5,936	76	5,771	63	11,126	63	7,144	69	8,213	57	9,327	66	68
22-Jun	10,440	68	9,242	82	9,482	73	6,672	73	6,041	77	5,931	65	11,797	67	7,583	73	8,530	59	9,717	69	71
23-Jun	10,587	69	9,605	85	9,698	75	7,189	79	6,075	78	6,190	68	12,269	69	8,746	85	10,077	70	10,360	74	75
24-Jun	10,865	70	9,890	88	10,274	79	7,430	81	6,118	78	6,789	74	13,292	75	8,819	85	12,048	84	10,938	78	79
25-Jun	11,077	72	10,095	90	10,614	82	7,527	82	6,490	83	7,229	79	14,207	80	8,915	86	12,560	87	11,380	81	82
26-Jun	11,836	77	10,137	90	10,754	83	7,667	84	6,732	86	7,724	85	14,618	83	9,010	87	12,626	88	11,645	83	84
27-Jun	12,084	78	10,180	90	10,815	83	7,800	85	6,778	87	7,906	87	15,177	86	9,083	88	12,778	89	11,984	85	86
28-Jun	12,347	80	10,202	91	11,419	88	7,933	87	6,872	88	7,990	87	15,557	88	9,269	90	12,839	89	12,247	87	87
29-Jun	13,192	85	10,400	92	11,916	92	8,067	88	6,908	88	8,093	89	15,702	89	9,434	91	12,881	90	12,453	89	89
30-Jun	13,312	86	10,561	94	12,039	93	8,153	89	6,947	89	8,261	90	16,291	92	9,557	92	12,964	90	12,664	90	91
01-Jul	13,396	87	10,656	95	12,122	93	8,221	90	6,960	89	8,443	92	16,446	93	9,582	93	13,177	92	12,816	91	91
02-Jul	13,430	87	10,739	95	12,338	95	8,285	91	7,186	92	8,522	93	16,676	94	9,642	93	13,418	93	13,035	93	93
03-Jul	13,651	88	10,809	96	12,370	95	8,395	92	7,234	93	8,619	94	16,771	95	9,750	94	13,577	95	13,212	94	94
04-Jul	13,815	90	10,821	96	12,465	96	8,474	93	7,266	93	8,661	95	16,810	95	9,809	95	13,701	95	13,348	95	94
05-Jul	14,148	92	10,834	96	12,514	96	8,503	93	7,288	93	8,691	95	16,850	95	9,858	95	13,766	96	13,408	96	95
06-Jul	14,251	92	10,877	97	12,549	97	8,581	94	7,368	94	8,740	96	16,914	96	9,988	97	13,852	96	13,511	96	95
07-Jul	14,543	94	10,894	97	12,572	97	8,660	95	7,408	95	8,806	96	17,155	97	10,087	98	13,928	97	13,601	97	96
08-Jul	14,667	95	10,948	97	12,589	97	8,750	96	7,438	95	8,832	97	17,182	97	10,132	98	13,980	97	13,690	98	97
09-Jul	14,668	95	10,953	97	12,610	97	8,755	96	7,471	96	8,873	97	17,220	97	10,153	98	14,035	98	13,731	98	97
10-Jul	14,669	95	10,970	98	12,636	97	8,768	96	7,530	96	8,942	98	17,315	98	10,153	98	14,094	98	13,779	98	97
11-Jul	14,721	95	10,970	98	12,638	97	8,840	97	7,547	97	8,973	98	17,359	98	10,172	98	14,120	98	13,825	98	97
12-Jul	14,862	96	10,971	98	12,640	97	8,891	97	7,573	97	8,990	98	17,376	98	10,194	99	14,153	99	13,862	99	98
13-Jul	14,943	97	10,973	98	12,691	98	8,916	98	7,587	97	9,008	99	17,414	98	10,194	99	14,165	99	13,872	99	98
14-Jul	14,962	97	10,999	98	12,709	98	8,958	98	7,615	97	9,025	99	17,420	98	10,202	99	14,177	99	13,904	99	98

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	1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1989-98
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	Avg %
15-Jul	14,991	97	11,025	98	12,711	98	8,967	98	7,649	98	9,036	99	17,459	99	10,211	99	14,181	99	13,916	99	98
16-Jul	14,998	97	11,042	98	12,715	98	8,984	98	7,659	98	9,054	99	17,490	99	10,227	99	14,191	99	13,924	99	98
17-Jul	15,013	97	11,042	98	12,721	98	9,003	99	7,682	98	9,069	99	17,512	99	10,234	99	14,212	99	13,933	99	99
18-Jul	15,019	97	11,042	98	12,728	98	9,018	99	7,704	99	9,082	99	17,516	99	10,249	99	14,216	99	13,946	99	99
19-Jul	15,077	98	11,042	98	12,728	98	9,020	99	7,704	99	9,088	99	17,549	99	10,256	99	14,248	99	13,969	99	99
20-Jul	15,092	98	11,051	98	12,733	98	9,030	99	7,706	99	9,094	99	17,577	99	10,260	99	14,274	99	13,973	99	99
21-Jul	15,127	98	11,076	98	12,749	98	9,054	99	7,708	99	9,099	99	17,581	99	10,266	99	14,280	99	13,977	99	99
22-Jul	15,160	98	11,087	99	12,795	99	9,060	99	7,713	99	9,104	99	17,585	99	10,289	99	14,293	99	13,978	99	99
23-Jul	15,192	98	11,093	99	12,809	99	9,060	99	7,716	99	9,105	99	17,599	99	10,291	99	14,299	99	13,981	99	99
24-Jul	15,209	99	11,105	99	12,835	99	9,069	99	7,749	99	9,108	99	17,610	99	10,293	99	14,302	99	13,984	99	99
25-Jul	15,210	99	11,107	99	12,835	99	9,076	99	7,749	99	9,111	99	17,618	99	10,298	99	14,303	99	13,986	99	99
26-Jul	15,241	99	11,115	99	12,836	99	9,080	99	7,757	99	9,111	99	17,620	99	10,301	99	14,308	99	13,992	99	99
27-Jul	15,257	99	11,118	99	12,881	99	9,081	99	7,758	99	9,113	99	17,628	99	10,305	99	14,314	99	13,993	99	99
28-Jul	15,258	99	11,133	99	12,886	99	9,086	99	7,771	99	9,115	99	17,637	99	10,307	99	14,322	99	14,004	99	99
29-Jul	15,268	99	11,158	99	12,892	99	9,088	99	7,778	99	9,116	99	17,649	99	10,308	99	14,323	99	14,005	99	99
30-Jul	15,310	99	11,169	99	12,897	99	9,091	99	7,781	99	9,118	99	17,651	99	10,314	99	14,325	99	14,009	99	99
31-Jul	15,318	99	11,180	99	12,901	99	9,094	99	7,781	99	9,118	99	17,659	99	10,316	99	14,325	99	14,013	99	99
01-Aug	15,323	99	11,192	99	12,901	99	9,098	99	7,788	99	9,120	99	17,664	99	10,321	99	14,326	99	14,017	99	99
Season Total	15,432		11,251		12,988		9,135		7,819		9,138		17,701		10,344		14,357		14,038		

Appendix G6.-Chignik River chinook salmon escapement, time of entry, 1987-1996.

Date	1987 % Total	1988 % Total	1989 % Total	1990 % Total	1991 % Total	1992 % Total	1993 % Total	1994 [a] % Total	1995 % Total	1996 % Total	1987-96 % Avg.
20-Jun	1	0	1	1	1	1	1	1	1	2	1
21-Jun	1	0	1	1	2	1	1	1	1	2	1
22-Jun	1	1	1	1	2	1	1	1	1	3	1
23-Jun	1	1	1	1	2	1	2	1	1	3	1
24-Jun	2	1	1	1	2	2	4	2	1	4	2
25-Jun	2	1	1	3	3	4	5	2	1	4	3
26-Jun	2	2	1	5	3	4	7	2	1	6	3
27-Jun	5	3	2	5	4	5	9	2	2	9	5
28-Jun	6	3	2	6	6	9	11	4	3	11	6
29-Jun	7	5	10	7	6	11	14	6	3	14	8
30-Jun	8	6	10	10	7	15	16	9	3	16	10
01-Jul	9	6	12	12	9	18	17	10	3	19	11
02-Jul	13	7	13	14	11	21	19	11	3	22	13
03-Jul	14	13	23	16	13	23	23	14	3	24	17
04-Jul	15	19	28	19	15	28	29	19	4	25	20
05-Jul	16	26	29	23	19	34	33	25	5	29	24
06-Jul	17	27	30	26	22	37	38	30	16	31	27
07-Jul	19	30	35	30	23	41	42	32	18	34	30
08-Jul	24	33	38	36	36	48	43	38	23	35	35
09-Jul	29	41	40	46	42	53	44	43	29	37	40
10-Jul	39	57	45	48	45	58	49	49	34	44	47
11-Jul	42	66	46	50	50	64	56	53	36	47	51
12-Jul	45	71	48	53	52	69	61	58	44	51	55
13-Jul	52	72	58	55	56	72	68	61	53	54	60
14-Jul	54	74	61	61	60	75	74	63	58	55	63
15-Jul	63	77	67	66	63	81	77	66	63	58	68
16-Jul	68	78	68	68	68	82	82	73	63	62	71
17-Jul	70	81	69	71	69	84	85	78	65	68	74
18-Jul	73	84	70	75	69	86	88	82	69	72	77

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Date	1987 % Total	1988 % Total	1989 % Total	1990 % Total	1991 % Total	1992 % Total	1993 % Total	1994 [a] % Total	1995 % Total	1996 % Total	1987-96 % Avg.
19-Jul	74	86	72	78	72	88	93	84	74	74	79
20-Jul	79	88	74	81	79	90	95	88	76	77	83
21-Jul	84	90	75	86	80	91	95	89	78	78	85
22-Jul	87	92	83	90	87	92	95	91	81	80	88
23-Jul	90	92	87	91	90	93	96	93	83	82	90
24-Jul	92	93	89	92	93	94	97	95	84	84	91
25-Jul	96	94	90	93	95	95	97	96	87	86	93
26-Jul	97	96	92	95	96	96	98	97	89	87	94
27-Jul	97	96	93	97	97	97	98	98	91	89	95
28-Jul	98	98	95	98	98	97	99	99	91	90	96
29-Jul	99	99	99	99	99	99	99	99	92	91	97
30-Jul	99	99	99	99	99	99	99	99	92	92	98
31-Jul	100	100	100	100	100	100	100	100	100	100	100
Season Total	2,624	4,868	3,316	4,364	4,545	3,806	1,946	3,016	4,288	3,488	

Note: Percentages are based on weir passage estimates and a 3-day lag time applied to catches made in Chignik Lagoon (statistical area 271-10) to appropriate arrival at the weir. In addition, percentages do not include 1- and 2-ocean chinook salmon which cannot be distinguished from sockeye at the weir counting gate.

[a] Starting in 1994 underwater video cameras were used to count fish. One- and 2-ocean chinook salmon were counted. In the past these small chinook salmon were not distinguishable from sockeye salmon and abundance estimates of small chinook were based on scale samples. Also beginning in 1994 each fish was actually counted. In previous years 10-minute counts were made each hour and these counts were expanded to generate an estimated count.

APPENDIX H. EMERGENCY ORDERS ISSUED FOR THE KMA, 1989-1998

Appendix H1.-1989 KMA emergency orders.

Emergency Order Number	Effective Date	Action/Justification
2-SS-4-17-89	9/11/89 12:01 a.m.	Extended the closure for freshwater streams flowing into Monashka and Chiniak Bays to sport fishing for salmon beginning 12:01 a.m. September 11, 1989 through 12:01 a.m. October 1, 1989 including the Buskin River upstream of Bridge #1. Low escapement of coho salmon and late spawning of pink salmon was the stated justification.
2-SS-4-18-89	9/18/89	Rescinded E. O. # 2-SS-4-17-89. Surveys and weir counts indicated sufficient escapement had been achieved and more fish were returning daily.

Appendix H2.-1990 KMA emergency orders.

Emergency Order Number	Effective Date	Action/Justification
2-SS-4-27-90	9/6/90 Noon	Closed Morris Cove Creek, Humpy Cove Creek, Summers Bay Creek, Captains Bay Creek, Unalaska Creek from the outlet of Unalaska Lake to the downstream end of the Church Hole to sport fishing. Extremely low water hindered coho escapement plus illegal snagging was increasingly common.
2-SS-4-31-90	9/21/90 6:00 a.m.	Above waters were reopened, with the exception of Unalaska Creek from the Iliulik Bridge to the Church Hole. Normal water flows were allowing escapement to occur.
2-SS-4-28-90	9/11/90 12:01 a.m.	Extended the closure of salmon sport fishing upstream of the highway in streams flowing into Monashka and Chiniak bays. The Buskin River remained closed above Bridge #1. Coho escapement in the Buskin, Roslyn, American and Olds were below average.
2-SS-4-33-90	9/26/90 6:00 a.m.	Above waters were opened to salmon sport fishing. Normal coho escapement was being achieved.

Appendix H3.-1991 KMA emergency orders.

Emergency Order Number	Effective Date	Action/Justification
2-PS-4-11-91	6/15/91 Midnight	Closed the fresh waters of Unalaska, Iliukliuk, Humpy, and Summers Cove due to low escapements and high harvests.

Appendix H4.-1992 KMA emergency orders.

Emergency Order Number	Effective Date	Action/Justification
2-PS-4-30-92	8/17/92	The majority of streams along the Kodiak Road System Zone are experiencing the third consecutive year of below average pink salmon escapements. Eight index streams were surveyed on August 13 and minimum escapement goals are expected to be reached in only two of these streams. The Buskin, American and Olds rivers are the major pink salmon producing streams in Chiniak Bay and only about one half of the minimum escapement goal is expected to be reached in these streams. In order to conserve the pink salmon resources along the Kodiak Road System Zone and still allow for a limited harvest where stocks are not severely depressed, the bag and possession limit for pink salmon is being reduced to 2 fish and the Buskin, American and Olds rivers are being closed to pink salmon fishing.
2-SS-4-32-92	9/11/92	Coho salmon escapement counts through the Buskin River weir are low for this time of year, and the count of 1,187 as of September 8 may indicate a below average return. The 1992 Buskin River parent year had the lowest coho escapement since a weir was installed in 1985, and this also indicates that the 1992 coho return may be weak. Other index streams in Chiniak Bay also have had low numbers of coho in them. In order to ensure that escapement goals are met and that the reproductive potential of the coho stocks is not damaged, salmon fishing will remain closed above the highway for streams flowing into Monashka and Chiniak bays, with the exception of the Buskin River which will remain closed above Bridge No. 1. This enclosure does not affect saltwater fishing or streams that do not flow into Chiniak or Monashka Bay.

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Emergency Order Number	Effective Date	Action/Justification
2-SS-4-32-92	9/11/92	Coho salmon exhibit wide ranging dates of when they return which vary from year to year and are often influenced by weather conditions and water levels in streams. The Department will continue to monitor escapement into the Buskin River and other indexed streams and if escapement improves, waters above the Chiniak Highway will be opened to fishing.
2-SS-4-35-92	10/7/92	Coho salmon escapements into Chiniak and Monashka Bay streams have been late and below average in number. In order to ensure that sufficient spawning escapement occurred so that strong returns would continue in the future, sport fishing for salmon above the Chiniak Highway and Bridge #1 on the Buskin River was closed. The Department has continued to monitor escapements, and in early October minimum spawning goals were surpassed so that a sport fish harvest above the Chiniak Highway can now occur without damaging the reproductive potential of the coho stocks. The Buskin River is the major producer of coho in Chiniak Bay, and the weir allows accurate counts of escapement. On October 1 the weir count was 6,000 coho with daily counts averaging about 100 coho. Since minimum escapement goals have been exceeded at this time and because fish are still entering the rivers, flowing waters above the Chiniak Highway and above Bridge #1 on the Buskin River will be open to salmon fishing effective Wednesday, October 7.

Appendix H5.-1993 KMA emergency orders.

Emergency Order Number	Effective Date	Action/Justification
2-KS-4-09-93	6/3/93	The Buskin River was open to sport fishing for king salmon. Returning adult king salmon from the Mill Bay stocking project were straying into the Buskin River. Opening the Buskin River to king salmon fishing would allow these fish to be harvested.

Appendix H6.-1994 KMA emergency orders.

Emergency Order Number	Effective Date	Action/Justification
2-KS-4-08-94	5/28/94	In 1989 the Department of Fish and Game initiated a king salmon stocking program in Mill Bay. This program was intended to create a put-and-take fishery where all returning adult king salmon would be harvested by anglers. Yearly stocking of king salmon smolt is intended to maintain the return, so natural spawning of adult kings is not needed. Some returning adults strayed from Mill Bay and entered the Buskin River drainage. The Buskin River is currently closed to king salmon fishing by regulation and has no natural run. This Emergency Order opened sport fishing for king salmon in the Buskin River drainage so that the returning adults to the Mill Bay stocking project could be harvested.
2-SS-4-40-94	9/11/94	Coho salmon escapement counts through the Buskin River weir were low for the time of year, and the count of 400 as of September 6 indicated a below average return. Other index streams in Chiniak Bay also had low numbers of coho in them. In order to ensure that escapement goals were met and that the reproductive potential of the coho stocks was not damaged, salmon fishing remained closed above the highway for streams flowing into Monashka and Chiniak bays, with the exception of the Buskin River which remained closed above Bridge No. 1. The closure did not affect saltwater fishing or streams that do not flow into Chiniak or Monashka Bay.

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Emergency Order Number	Effective Date	Action/Justification
2-SS-4-42-94	9/17/94	Coho salmon escapements into Chiniak and Monashka Bay streams had been late and below average in number. In order to ensure that sufficient spawning escapement occurred so strong returns would continue in the future, sport fishing for salmon above the Chiniak Highway and Bridge #1 on the Buskin River was closed. The Department continued to monitor escapements. Weir counts improved on September 14, and interim spawning goals were surpassed so that a sport fish harvest above the Chiniak Highway could occur without damaging the reproductive potential of the coho stocks. The Buskin River is the major producer of coho in Chiniak Bay, and the weir allows accurate counts of escapement. On September 14 the season total weir count was 3,526 with daily counts averaging about 300 coho. Since interim escapement goals had been exceeded and because fish were still entering the rivers, it was anticipated that spawning goals would be met. Therefore, flowing waters above the Chiniak Highway and above Bridge #1 on the Buskin River were open to salmon fishing effective Saturday, September 17.

Appendix H7.-1995 KMA emergency orders.

Emergency Order Number	Effective Date	Action/Justification
2-KS-4-05-95	5/20/95	In 1989 the Department of Fish and Game initiated a king salmon stocking program in Mill Bay. This program was intended to create a put-and-take fishery where all returning adult king salmon would be harvested by anglers. Yearly stocking of king salmon smolt is intended to maintain the return, so natural spawning of adult kings is not needed. Some returning adults strayed from Mill Bay and entered the Buskin River drainage. The Buskin River is currently closed to king salmon fishing by regulation and has no natural run. This emergency order opened sport fishing for king salmon in the Buskin River drainage so that the returning adults to the Mill Bay stocking project could be harvested.

Appendix H8.-1996 KMA emergency orders.

Emergency Order Number	Effective Date	Action/Justification
2-SS-4-42-96	9/9/96	The Department operates a weir on the Buskin River in order to enumerate coho salmon. A weir count of 6,000 coho by October 1 is necessary in order to achieve escapement goals and ensure the reproductive potential of the stock is not jeopardized. Due to the sporadic run timing of the return, the opening date for salmon fishing in the upper Buskin drainage is often adjusted from the established regulation date in order to account for variations in run timing and size. As of September 4, 3,300 coho have been counted through the weir, and it is projected that the final weir count on October 1 will significantly exceed the 6,000 fish goal. Because of the early run timing and strength of the return, the entire Buskin River will open to salmon fishing on September 9, seven days before the regulation opening date.

Appendix H9.-1998 KMA emergency orders.

Emergency Order Number	Effective Date	Action/Justification
2-SS-4-31-98	9/16/98	This emergency order closes the American river to sport fishing for salmon. The American river is now closed to salmon fishing, including waters both upstream and downstream of the highway bridge. The coho escapement goal for the American River is 300 to 400 fish. Stream surveys conducted on September 8, 13 and 14 counted 14, 33 and 80 coho, respectively. Coho returns to road system streams usually reach the halfway mark by mid September. It appears likely that the spawning goal will not be reached. Closing the river to sport fishing for salmon will allow for more fish to spawn and come closer to achieving the escapement goal.
2-SS-4-31-98	10/8/98	This emergency order opens the entire American River to sport fishing for salmon. The coho escapement goal for the American River is 300 to 400 fish. Stream surveys conducted on September 8, 13 and 14 counted 14, 33 and 80 coho, respectively. It appeared likely that the coho escapement goal would not be achieved, so on September 16 the American River was closed to salmon fishing. In early October a survey documented a coho count of over 600 fish. A department research crew, which has been beach seining in the river, has documented that over half the coho are still bright silver, indicating that they have just recently entered the river. Because the coho return has recently increased, spawning goals will still be achieved if sport harvest occurs. For this reason the American River is now open to sport fishing for salmon.